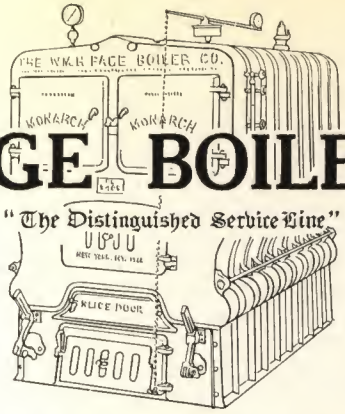
PAGE BOILERS

1929

MEADVILLE, PA., PLANT



PAGE BOILERS

VOLUNTEER
AND
MONARCH

For heating buildings of every description
by steam, vapor and hot water, with any fuel.

CATALOGUE NO. 55

1929

THE WM. H. PAGE BOILER CO.
ESTABLISHED 1856 INCORPORATED 1876
Makers of Boilers for more than Seventy Years

GENERAL OFFICES:
200 MADISON AVENUE, NEW YORK

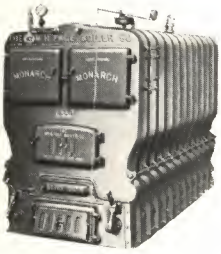
BRANCHES:
BOSTON, 123 Beverly St. WASHINGTON, 1117-15th St., N. W.
CLEVELAND, Rose Building
BALTIMORE, 502 St. Paul St. PHILADELPHIA, 1126 Washington Ave.

FACTORY: MEADVILLE, PA.

For Sale by Plumbing and Heating Contractors Everywhere

PAGE BOILERS

BURN ANY COAL,
OIL OR GAS



ANNOUNCEMENT

GENERALLY acknowledged supremacy is not the work of a day, or a year, but the cumulative result of many years' leadership which compels gradual recognition and emulation on the part of others in the same field.

It is not the outcome of claims or arguments, but solely the result of years of striving for the attainment of an ideal, counting no effort too great to bring about that superlative degree of excellence which gains recognition upon merit alone.

We commenced the manufacture of steam and hot water heating apparatus over seventy years ago and our boilers may now be found in all classes of buildings, not only throughout the United States but in many foreign countries, and we are today the largest maker of boilers exclusively in the world. That this has been accomplished with little advertising other than from satisfied and enthusiastic users is, in itself, an indication of success, but it has only been possible through constant efforts to improve the quality of our product.

That we have attained success in the production of boilers unequalled in economy, efficiency, design, durability and ease of operation is attested by the many thousands of users of boilers of our manufacture, to whose endorsement we are indebted for increased sales and consequent prosperity.

At Meadville, Pennsylvania, in the heart of the iron, coal and natural gas section, we operate one of the most extensive, best equipped and thoroughly up-to-date plants devoted to the production of boilers. Warehouses are maintained at convenient shipping points, facilitating prompt distribution.

The exceptionally efficient and economical performance of Page Boilers and service in deliveries to our customers has resulted in their being universally known as "The Distinguished Service Line."

Yours for service,

THE WM. H. PAGE BOILER COMPANY

METHOD OF RATING

RATINGS of Page Boilers are derived from tests made in accordance with the American Society of Heating and Ventilating Engineers' Low-Pressure Boiler Code.

The following is a simple explanation of this method of determining ratings:

"In computing the rating of any heating boiler, the pounds of coal burned from one fuel charge, multiplied by the pounds of water evaporated by one pound of coal burned, gives the pounds of steam produced—which, divided by the number of hours the boiler is to run without attention, gives the pounds of steam made each hour—this multiplied by four, which is the number of square feet of radiator surface required to condense one pound of steam per hour, gives the boiler's continuous rating for the number of hours it operates without attention."

FUEL BASIS FOR RATINGS

Ratings of Page Boilers are based on tests made with anthracite coal of 12,500 B.t.u., with chimney flue of proportions to provide sufficient draft to properly burn the fuel. Anthracite coal is used since that fuel is more nearly uniform in its characteristics and heat value.

When other types of fuel such as bituminous, coke, lignite, etc., are used, due consideration should be given to differences in calorific value, space occupied by a given weight of the fuel and the characteristics which determine the amount of attention necessary to secure proper combustion for the desired output.

RATINGS OF WATER BOILERS

In determining the actual capacity of water boilers, the same formula is used as for steam and the result multiplied by 1.65.

RATING CONDITIONS

Boiler ratings as given are derived from careful and exhaustive tests which proved their safety, and are based on a standard of 2 lbs. pressure maintained at the boiler for steam and 180 degrees for hot water.

All Piping (mains and risers, flows and returns) is to be figured as radiating surface in addition to the direct and indirect radiation attached to same. Under average conditions the allowance for piping may be considered equal to approximately 50% of the net amount of cast iron radiation.

Sufficient radiation must be installed to easily raise and maintain a temperature of 70 degrees.

Additional allowance must be made for use of direct-indirect, indirect radiation and contingencies, as follows:

Direct-indirect radiators: Each foot of surface is considered equal to 1⅓ ft. of direct radiation.

Indirect radiators: Each foot of surface is considered equal to 1½ ft. of direct radiation.

Pipe Coils: Each foot of surface is considered equal to 1¼ ft. of direct radiation.

Coil, waterback, or other appliance for heating water for domestic use: Each gallon of storage capacity is considered equal to 2 ft. of direct steam radiators, or 3 ft. of direct water radiators.

SELECTION OF BOILER

In selecting the size of boiler for use with any heating system, due consideration should be given all conditions surrounding the particular installation for which boiler is required. It is important, in determining correct boiler capacities for given loads, that ample safety factors of reserve capacity be provided.

BOILER COVERING

Both on account of increased efficiency and greater economy, we recommend that all boilers be thoroughly protected by a substantial covering of asbestos. The amount of asbestos cement required to cover any of our boilers may be estimated by allowing approximately 6 lbs. to the square foot of surface to be covered—1¼ inches thick.

CHIMNEY FLUES

One of the most important factors in connection with a heating installation is the flue to which the boiler is connected. To a large extent the capacity of the boiler depends on the size and height of the flue. If the flue cannot develop sufficient draft intensity to burn the necessary amount of coal to develop the boiler rating, the result will be the same as if a boiler of insufficient capacity were installed. When chimney is already built, the boiler best suited for the draft available should be selected.

Full information regarding flue sizes and recommendations for chimney construction will be found on pages 95, 96, and 97.

GUARANTEE

Boilers are guaranteed only to the extent of furnishing new castings for any found defective in manufacture. All castings are thoroughly tested and subjected to a rigid inspection before leaving our works. On account of the varying conditions surrounding their installation, we do not guarantee our boilers except as above.

A

PAGE

RED DIAMOND

THE ACE OF

JACKETED BOILERS

A

PAGE RED DIAMOND JACKETED BOILERS

A NEW PAGE IN BOILER PROGRESS
BURNS ANY COAL, OIL OR GAS

PAGE RED DIAMOND JACKETED BOILER COMBINES RARE BEAUTY AND EXCEPTIONAL EFFICIENCY

FOR heating the home, and other smaller buildings, Page has designed a boiler in the mode of the day—The Red Diamond Jacketed Boiler—a new Page in boiler progress.

This boiler, with its distinctive beauty of rich lustrous red enamel finished jacket, and glossy black doors, has had an immediate appeal for all who have felt a sense of pride in the appearance of their cellars, and have been anxious to transform them into more useful, livable places, perhaps a room for rainy day recreation.

For the practical minded, who look beneath the surface, the internal arrangement of the Red Diamond Boiler—the construction that will assure comfort when zero weather comes along—has as great an appeal as the very attractive exterior.

They recognize beneath its square casing the famous *round* boiler which has made the name PAGE synonymous with *heating satisfaction.*

ABUNDANCE OF WARMTH AT A MINIMUM OUTLAY FOR FUEL

In the Red Diamond Boiler there are provided large areas of grate and heating surface, two vitally important factors which make for ease of operation, and an abundance of warmth at a minimum outlay for fuel. When this very efficient construction is placed within its beautiful red enameled jacket, lined at top and every side with 1¼" improved air cell asbestos insulation, the result is not only a boiler very pleasing to the eye, but one of exceptional power in the rapid generation of heat, and unusually economical in fuel consumption.

PAGE RED DIAMOND JACKETED BOILERS

CUTAWAY VIEW OF JACKETED BOILER, SHOWING ROUND FIREPOT AND STAGGERED TRIPLE-FLUE FIRE TRAVEL, THE MOST EFFICIENT FORM FOR SMALL HEATING WORK—ALSO IMPROVED AIR CELL ASBESTOS INSULATION, ATTACHED TO JACKET

The air space between the boiler and the insulated jacket provides double insulation, perfectly conserving the heat given off by the burning fuel, all of which heat is carried through the staggered flue surfaces of the boiler, and is available for radiator heat, instead of being dissipated through the cellar or up the chimney.

ROUND FIREPOT FOR GREATEST EFFICIENCY IN HOME HEATING BOILERS

The firepot of the Red Diamond Boiler is round, which form is more favorable than a square firebox in the smaller heating boilers required for the average home, and the exceptional depth of the firepot will permit of carrying a bed of fuel sufficient to develop the full capacity of the boiler, and render frequent re-fueling unnecessary. Attention twice a day should be sufficient.

IMPROVED GRATES

The Red Diamond grates are triangular in form, all shaker bars and interchangeable, conceded to be the most satisfactory, efficient and durable for house heating boilers.

TRIPLE-FLUE SECTIONS AND OVER-SIZE STEAM DOME

The sections above the firepot in the Red Diamond Boiler are so constructed that the passage of the gases of combustion will be through staggered or baffled flues, which retain the gases in the boiler until the heat is absorbed. This boiler, equipped with Triple-flue Intermediate Sections, has demonstrated marked fuel economy, with oil as well as coal.

The steam dome is made unusually broad and deep, providing for very liberal steam disengaging space, and ample steam in reserve, insuring dry steam, and rapid and quiet circulation through mains, branches and radiators.

The dome for hot water boilers has less depth than the steam dome, reducing the water contained therein to an amount that will circulate freely and rapidly.

EASY TO SET UP

The Red Diamond Boiler is shipped all assembled, and the jacket casing is quickly attached by means of the lock-lap joints at the corners, a new and improved method.

With this arrangement the complete jacket can be easily attached or removed in a few minutes.

BEAUTY AND SERVICE

The Red Diamond Jacketed Boiler is a re-creation in a new and beautiful form of a product tried and tested by time, built from the accumulated experiences of more than 70 years, and has proved its value on thousands of heating installations.

At a very moderate cost, it brings into the home a colorful heating unit, of exceptional merit, and permanent, indestructible beauty.

PAGE RED DIAMOND JACKETED BOILERS

Ratings and Dimensions
STEAM

No. of Boiler	Rating Sq. Feet	Actual Dia. Grate and Firepot, Inches	Area of Grate, Sq. Feet	Height of Water Line, Inches	Outlets and Inlets, No. and Size	Dia. of Smoke Pipe, Inches	Chimney Flue Dimensions, Inches	Height of Chimney Flue, Feet
1-S-4	400	17	1.58	45¼	2-2½	7	8 x 8	30
1-S-5	450	17	1.58	49⅝	2-2½	7	8 x 8	30
2-S-4	550	19	1.97	45½	2-2½	7	8 x 8	30
2-S-5	650	19	1.97	49⅞	2-2½	7	8 x 8	30
3-S-4	800	22	2.64	45¾	2-3	9	8 x 12	35
3-S-5	900	22	2.64	50⅛	2-3	9	8 x 12	35
4-S-4	1050	25	3.41	46¾	2-3	9	8 x 12	35
4-S-5	1200	25	3.41	51⅛	2-3	9	8 x 12	35
5-S-4	1300	28	4.28	48¼	2-3½	10	12 x 12	35
5-S-5	1450	28	4.28	52⅝	2-3½	10	12 x 12	35

Page Red Diamond Boilers are built in conformity with the Boiler Code of the American Society of Mechanical Engineers. Ratings, as given, are derived from tests made in accordance with the American Society of Heating and Ventilating Engineers' Low-Pressure Boiler Code.

Ratings are based on a standard of 2 pounds pressure maintained at the boiler.

All piping (mains and risers, flows and returns) is to be figured as radiating surface in addition to the direct and indirect radiation attached to same.

For complete table of dimensions, see page 16.

PAGE RED DIAMOND JACKETED BOILERS

Rating and Dimensions
WATER

No. of Boiler	Rating Sq. Feet	Actual Dia. Grate and Firepot, Inches	Area of Grate, Sq. Feet	Outlets and Inlets, No. and Size	Height of Jacket, Inches	Dia. of Smoke Pipe, Inches	Chimney Flue Dimensions, Inches	Height of Chimney Flue, Feet
1-W-4	650	17	1.58	2-2½	43¾	7	8 x 8	30
1-W-5	725	17	1.58	2-2½	48½	7	8 x 8	30
2-W-4	850	19	1.97	2-2½	44½	7	8 x 8	30
2-W-5	1050	19	1.97	2-2½	48¾	7	8 x 8	30
3-W-4	1350	22	2.64	2-3	44½	9	8 x 12	35
3-W-5	1550	22	2.64	2-3	49¼	9	8 x 12	35
4-W-4	1700	25	3.41	2-3	45¾	9	8 x 12	35
4-W-5	1900	25	3.41	2-3	50	9	8 x 12	35
5-W-4	2200	28	4.28	2-3½	46½	10	12 x 12	35
5-W-5	2400	28	4.28	2-3½	50¾	10	12 x 12	35

Page Red Diamond Boilers are built in conformity with the Boiler Code of the American Society of Mechanical Engineers.

Ratings, as given, are derived from tests made in accordance with the American Society of Heating and Ventilating Engineers' Low-Pressure Boiler Code.

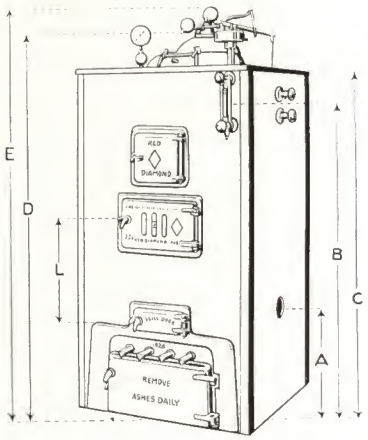
Ratings are based on a standard of 180 degrees at the boiler.

All piping (mains and risers, flows and returns) is to be figured as radiating surface in addition to the direct and indirect radiation attached to same.

For complete table of dimensions, see page 17.

PAGE RED DIAMOND JACKETED BOILERS

DIMENSIONS—STEAM BOILERS



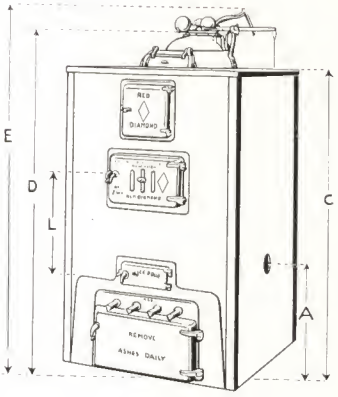
MEASUREMENTS ARE IN INCHES

No.	A	B	C	D	E	G	I	L	M	N	O
1-S-4	15¾	45¼	51	57	62	28½	21½	17	20½	19	7
1-S-5	15¾	49⅝	55	61⅜	66⅜	28½	21½	17	20½	19	7
2-S-4	16¼	45½	51½	57¾	62½	30½	23½	17	20½	21	7
2-S-5	16¼	49⅞	56½	62⅜	66⅞	30½	23½	17	20½	21	7
3-S-4	17	45¾	52	59	63½	34	26½	17	20½	24½	9
3-S-5	17	50⅜	56¼	63⅜	67⅞	34	26½	17	20½	24½	9
4-S-4	17	46¾	53	59¾	64½	37	29¾	18	21¾	27	9
4-S-5	17	51⅜	57½	64⅛	68⅞	37	29¾	18	21½	27	9
5-S-4	17½	48¼	54	61½	66¼	39	31¾	19	22½	27	10
5-S-5	17½	52⅝	58	65⅞	70¼	39	31¾	19	22½	27	10

Dimension G is square of jacket.
Dimension I is distance between returns.
Dimension M is depth of firepot from crownsheet to grate.
Dimension N is distance center to center of outlets.
Dimension O is diameter of smokepipe.

PAGE RED DIAMOND JACKETED BOILERS

DIMENSIONS—WATER BOILERS



MEASUREMENTS ARE IN INCHES

No.	A	C	D	E	G	I	L	M	N	O
1-W-4	15¾	43¾	49¾	54¾	28½	21½	17	20½	19	7
1-W-5	15¾	48½	54⅛	59⅛	28½	21½	17	20½	19	7
2-W-4	16¼	44½	50½	55½	30½	23½	17	20½	21	7
2-W-5	16¼	48¾	54⅞	59⅞	30½	23½	17	20½	21	7
3-W-4	17	44½	51¼	56⅝	34	26½	17	20½	24½	9
3-W-5	17	49¼	55⅝	61	34	26½	17	20½	24½	9
4-W-4	17	45¾	51½	57	37	29¾	18	21½	27	9
4-W-5	17	50	56⅞	61⅜	37	29¾	18	21½	27	9
5-W-4	17½	46½	54	58¾	39	31¾	19	22½	27	10
5-W-5	17½	50¾	58⅜	63⅜	39	31¾	19	22½	27	10

Dimension G is square of jacket.
Dimension I is distance between returns.
Dimension M is depth of firepot from crownsheet to grate.
Dimension N is distance center to center of outlets.
Dimension O is diameter of smokepipe.

VOLUNTEER
NEW SERIES ROUND BOILERS

THE New Series Volunteer Boilers represent the culmination of seventy years' experience in the design and construction of heating boilers.

No effort or expense has been spared in their development. Conservatively designed on a sound engineering basis at the outset, with the maximum factors of safety and efficiency at every point, the New Series Volunteer represents the supreme combination of all the good features in boiler construction.

No boilers ever produced during the seventy years of our existence have met with such instantaneous, enthusiastic reception and preference from the members of our great heating industry.

GRATE AND HEATING SURFACE

In designing the Volunteer Boilers care was exercised to maintain the proper ratio of grate and heating surface and in these boilers each section over the firepot means an actual increase in efficiency, the evaporative power increasing as sections are added. Where flue conditions are favorable, the highest efficiency and economy will be realized through the use of the series boiler with the greatest number of intermediate sections.

SELECTION OF BOILER

Study of the assemblage of the Volunteer Boilers, in the several series, will assist in the selection of the size

VOLUNTEER ROUND BOILERS

NEW SERIES

No. 5 SERIES VOLUNTEER STEAM BOILER
BURNS ANY COAL, OIL OR GAS

best adapted for efficient and economical service under the given conditions.

Volunteer Boilers are adapted for burning any kind of fuel: hard or soft coal, lignite, wood, gas or oil.

They are built entirely of the best grade of cast iron, in conformity with the Boiler Code of the American Society of Mechanical Engineers, and conservatively rated in accordance with the American Society of Heating and Ventilating Engineers' Low Pressure Boiler Code, and their capacities are absolutely established by long and severe tests under every conceivable condition.

The Volunteer Boilers embody many advantageous features not found in other boilers.

ASHPIT AND GRATE

The circular ashpit or base, which also forms the support for the grate and firepot, allows ample depth for accumulation of ashes.

The Volunteer patent triangular revolving grate used in our boilers is conceded to be far superior to any other style of grate. It is easily operated, each bar being a shaker bar and interchangeable; and as it thoroughly grinds up and deposits the ashes in the ashpit and clinkers are not allowed to form, there is no necessity of using a poker or slicer bar.

Volunteer Ashpit and Grate

By occasionally revolving the bars one-third and exposing another side to the fire they will remain straight, and if ashes are not allowed to accumulate underneath they will last a lifetime.

VOLUNTEER ROUND BOILERS

NEW SERIES

No. 6 SERIES VOLUNTEER WATER BOILER
BURNS ANY COAL, OIL OR GAS

EASE OF CHANGING THE GRATE

The grate bars fit into holes in back of the base and the front ends rest in grooves on a supporting rest held in place by the ashpit front.

By taking off this front, which can be done by removing the four corner bolts, this supporting rest falls forward and the entire grate or any part of it can be removed and new bars put in, if necessary, in a few minutes.

EASE OF CLEANING

The Volunteer Boilers are provided with conveniently placed, hinged clean-out doors, through which all the fire surfaces are easily accessible for cleaning. This is a very essential feature, as in order to obtain full efficiency and economy these surfaces should be kept clean.

FIREPOT

The Volunteer firepot is of liberal depth, providing large coal-carrying capacity and deep body of fire, insuring the highest efficiency and economy with minimum of attention.

The crownsheet and walls surrounding the fire form the most effective and valuable surface, being exposed to the heat at its greatest intensity.

All firepots are provided with openings for the introduction of coil or waterback for domestic water heating.

NIPPLE CONNECTIONS

All joints are made with heavy machine-turned, smooth-tapered nipples of cast iron. These nipples fit into reamed openings in sections and when the tie-bolts on the boiler are drawn up, afford a perfect and permanent connection, not affected by expansion and contraction.

SECTIONS

The triple-flue sections above the firepot are so arranged as to present to the action of the fire the most effective heating surface. The openings in the sections through which the products of combustion pass are staggered, impinging the gases at an angle against the section above, and in their travel practically all the gases are consumed and the greatest possible percentage of heat units released and absorbed by the water before leaving the boiler.

Leading heating engineers acknowledge this construction to be the most efficient and economical.

STEAM DOME

The steam dome of the Volunteer Boilers is broad and deep, providing a very liberal steam disengaging space, allowing ample steam in reserve, and also insuring dry steam, which is essential for efficient, noiseless operation.

All steam domes are tapped on left side below water line for connecting external domestic water supply heater. See pages 74 and 75.

WATER DOME

The water dome of the Volunteer Boilers has less depth than the steam dome, reducing the water contained therein to an amount that will readily absorb the heat units and circulate freely and rapidly.

In all other respects the Volunteer steam and water boilers are identical in construction, the water boiler embodying the same features that make for exceptional efficiency and economy in the steam boiler.

AUTOMATIC REGULATION

Volunteer Steam Boilers are regularly equipped with the Page metallic sylphon damper regulator, highly sensitive and durable. This regulator responds to the slightest change in pressure, and connected to the center-hinged, perfectly balanced ashpit draft door and smokehood check draft, automatically keeps the steam at the proper point for economical heating.

No damper is needed in the flue connection, for the smokehood is provided with both choke and check dampers.

The Page metallic sylphon damper regulator for Hot Water Boilers (as shown on page 81) can be furnished, if desired, at an extra charge. With this regulator, attached to the draft and check doors as on steam boiler, the same efficient regulation is realized.

TESTS AND DURABILITY

Page Volunteer Boilers are made of the finest grade of cast iron, by workmen skilled in the art. All parts are accurately machined and fitted, and thoroughly tested to

100 pounds hydrostatic pressure, and after they are assembled the complete boilers are again subjected to another test at the same pressure as an extra precaution.

Water and fuel gases have no appreciable effect on cast iron, while they are highly destructive to sheet iron and steel. Cast iron boilers are practically indestructible. We do not know how long Page Boilers will last but know of some that have been in constant service for over fifty years, and have yet to hear of one wearing out.

With proper care and attention they will outlive the building in which they are installed.

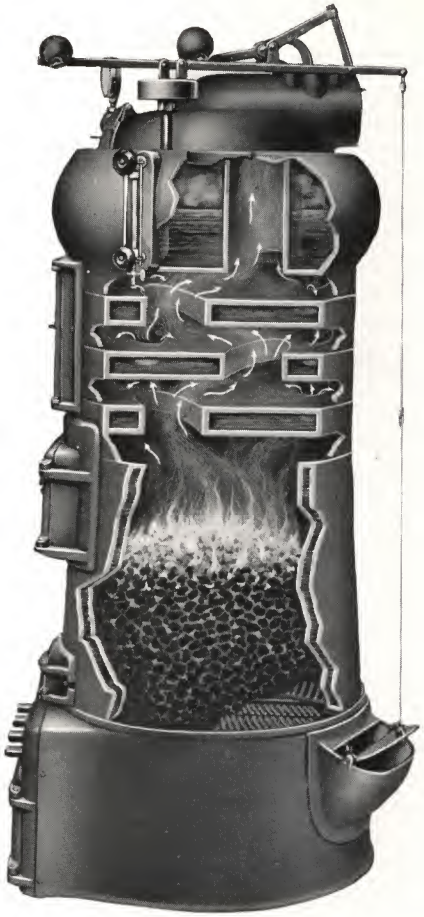
VOLUNTEER ROUND BOILERS

NEW SERIES

No. 6 SERIES VOLUNTEER STEAM BOILER
BURNS ANY COAL, OIL OR GAS

VOLUNTEER ROUND BOILERS

NEW SERIES

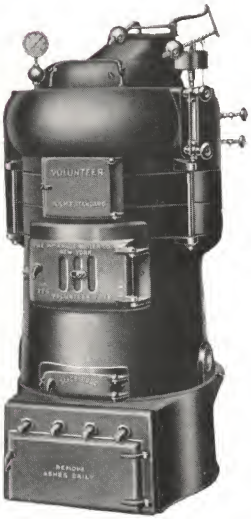


SHOWING DEEP FIREPOT, STAGGERED TRIPLE-FLUE FIRE TRAVEL, AND EXCEPTIONALLY LARGE STEAM DOME. ALSO INGENIOUS ARRANGEMENT OF AUTOMATIC DRAFT CONTROL.

VOLUNTEER ROUND BOILERS

NEW SERIES

No. 4 SERIES STEAM BOILER



No. 5 SERIES STEAM BOILER

BURN ANY COAL, OIL OR GAS

VOLUNTEER ROUND BOILERS

NEW SERIES

Ratings and Dimensions

STEAM

No. of Boiler	Rating Sq. Feet	Actual Dia., Grate and Firep't, Inches	Area of Grate, Sq. Feet	Height of Water Line, Inches	No. and Size Outlets and Inlets, Inches	Dia. of Smoke Pipe, Inches	Chimney Size (Sea Level), Inches	Chimney Height, Feet
No. 4 Series: Assemblage: Ashpit, Firepot, Triple-flue Section and Dome. Especially adapted for burning soft coal, or hard coal where draft is poor.								
174	350	17	1.58	45¼	2–2½	7	8 x 8	30
194	500	19	1.97	45½	2–2½	7	8 x 8	30
224	775	22	2.64	45¾	2–3	9	8 x 12	35
254	950	25	3.41	46¾	2–3	9	8 x 12	35
284	1200	28	4.28	48¼	2–3½	10	12 x 12	35
No. 5 Series: Assemblage: Ashpit, Firepot, Two Triple-flue Sections and Dome. For burning soft or hard coal, where normal chimney conditions exist.								
175	400	17	1.58	49⅜	2–2½	7	8 x 8	30
195	550	19	1.97	49⅞	2–2½	7	8 x 8	30
225	825	22	2.64	50⅜	2–3	9	8 x 12	35
255	1025	25	3.41	51⅜	2–3	9	8 x 12	35
285	1300	28	4.28	52⅝	2–3½	10	12 x 12	40
No. 6 Series: Assemblage: Ashpit, Firepot, Three Triple-flue Sections and Dome. More efficient for burning hard coal, with good draft, and recommended for oil-burning.								
176	450	17	1.58	54	2–2½	7	8 x 8	35
196	600	19	1.97	54¼	2–2½	7	8 x 8	35
226	875	22	2.64	54½	2–3	9	8 x 12	40
256	1100	25	3.41	55½	2–3	9	8 x 12	40
286	1400	28	4.28	57	2–3½	10	12 x 12	45
No. 7 Series: Assemblage: Ashpit, Firepot, Four Triple-flue Sections and Dome. Most efficient for burning hard coal where draft is excellent, and for oil-burning.								
227	925	22	2.64	58¾	2–3	9	8 x 12	40
257	1175	25	3.41	59⅞	2–3	9	12 x 12	40
287	1500	28	4.28	61⅜	2–3½	10	12 x 12	45

Volunteer Boilers are built in conformity with the Boiler Code of the American Society of Mechanical Engineers.

Ratings, as given, are derived from tests made in accordance with the American Society of Heating and Ventilating Engineers' Low-Pressure Boiler Code.

Ratings are based on a standard of 2 pounds pressure maintained at the boiler.

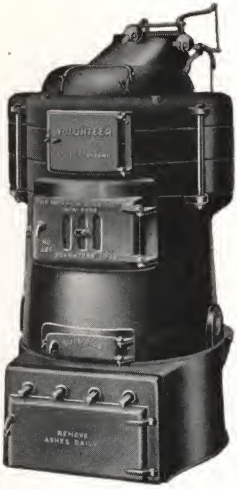
All piping (mains and risers, flows and returns) is to be figured as radiating surface in addition to the direct and indirect radiation attached to same.

Safety valve sizes conform with specifications of A.S.M.E. Boiler Code.

For complete table of dimensions, see page 32.

VOLUNTEER ROUND BOILERS

NEW SERIES



No. 5 SERIES WATER BOILER

No. 6 SERIES WATER BOILER

BURN ANY COAL, OIL OR GAS

VOLUNTEER ROUND BOILERS

NEW SERIES

Ratings and Dimensions

WATER

No. of Boiler	Rating Sq. Feet	Actual Dia., Grate and Firepot, Inches	Area of Grate Sq. Feet	Height to Top Outlets, Inches	No. and Size Outlets and Inlets, Inches	Dia. of Smoke Pipe, Inches	Chimney Size, Inches	Chimney Height, Feet
No. 4 Series: Assemblage: Ashpit, Firepot, Triple-flue Section and Dome. Especially adapted for burning soft coal, or hard coal where draft is poor.								
174	600	17	1.58	43½	2–2½	7	8 x 8	30
194	850	19	1.97	43½	2–2½	7	8 x 8	30
224	1300	22	2.64	43⅝	2–3	9	8 x 12	35
254	1575	25	3.41	44¼	2–3	9	8 x 12	35
284	1975	28	4.28	45½	2–3½	10	12 x 12	35
No. 5 Series: Assemblage: Ashpit, Firepot, Two Triple-flue Sections and Dome. For burning soft or hard coal, where normal chimney conditions exist.								
175	675	17	1.58	47⅞	2–2½	7	8 x 8	30
195	925	19	1.97	47⅞	2–2½	7	8 x 8	30
225	1375	22	2.64	48¼	2–3	9	8 x 12	35
255	1700	25	3.41	48⅝	2–3	9	8 x 12	35
285	2150	28	4.28	49⅞	2–3½	10	12 x 12	40
No. 6 Series: Assemblage: Ashpit, Firepot, Three Triple-flue Sections and Dome. More efficient for burning hard coal, with good draft, and recommended for oil-burning.								
176	750	17	1.58	52¼	2–2½	7	8 x 8	35
196	1000	19	1.97	52¼	2–2½	7	8 x 8	35
226	1450	22	2.64	52⅝	2–3	9	8 x 12	40
256	1825	25	3.41	53	2–3	9	8 x 12	40
286	2325	28	4.28	54¼	2–3½	10	12 x 12	45
No. 7 Series: Assemblage: Ashpit, Firepot, Four Triple-flue Sections and Dome. Most efficient for burning hard coal where draft is excellent, and for oil burning								
227	1525	22	2.64	57	2–3	9	8 x 12	40
257	1950	25	3.41	57⅜	2–3	9	12 x 12	40
287	2500	28	4.28	58⅝	2–3½	10	12 x 12	45

Volunteer Boilers are built in conformity with the Boiler Code of the American Society of Mechanical Engineers.

Ratings, as given, are derived from tests made in accordance with the American Society of Heating and Ventilating Engineers' Low-Pressure Boiler Code.

Ratings are based on a standard of 180 degrees at the boiler.

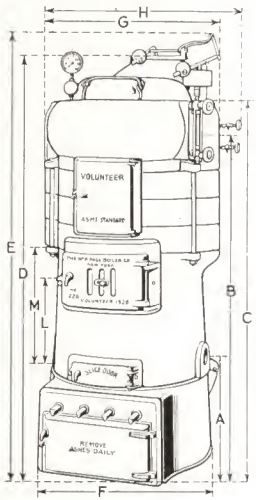
All piping (mains and risers, flows and returns) is to be figured as radiating surface in addition to the direct and indirect radiation attached to same.

For complete table of dimensions, see page 33.

VOLUNTEER STEAM BOILERS

NEW SERIES

DIMENSIONS



MEASUREMENTS ARE IN INCHES

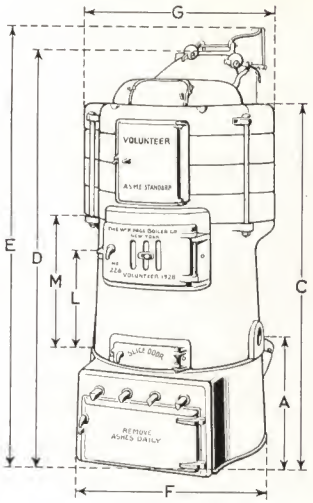
No.	A	B	C	D	E	F	G	H	I	L	M	N	O
174	15¾	45¼	50¼	55½	60½	23½	26	29	21½	17	20½	19	7
175	15¾	49⅝	54⅝	59⅞	64⅞	23½	26	29	21½	17	20½	19	7
176	15¾	54	59	64¼	69¼	23½	26	29	21½	17	20½	19	7
194	16¼	45½	50½	56¼	61	25¼	28⅛	31⅜	23½	17	20½	21	7
195	16¼	49⅞	54⅞	60⅜	65⅜	25¼	28⅛	31⅜	23½	17	20½	21	7
196	16¼	54¾	59¾	64⅞	69¾	25¼	28⅛	31⅜	23½	17	20½	21	7
224	17	45¾	50¾	57½	62	28¾	31¾	34¾	26½	17	20½	24½	9
225	17	50⅜	55⅜	61⅞	66⅜	28¾	31¾	34¾	26½	17	20½	24½	9
226	17	54½	59½	66¼	70¾	28¾	31¾	34¾	26½	17	20½	24½	9
227	17	58¾	63⅞	70⅝	75⅞	28¾	31¾	34¾	26½	17	20½	24½	9
254	17	46¾	51¾	58¼	63	31½	34⅝	37⅝	29¾	18	21½	27	9
255	17	51⅜	56⅜	62⅝	67⅜	31½	34⅝	37⅝	29¾	18	21½	27	9
256	17	55½	60½	67	71¾	31½	34⅝	37⅝	29¾	18	21½	27	9
257	17	59⅞	64⅞	71⅜	76⅜	31½	34⅝	37⅝	29¾	18	21½	27	9
284	17½	48¼	53¼	60	64¾	33¾	36¼	39¼	31¾	19	22½	27	10
285	17½	52⅝	57⅝	64⅜	68¾	33¾	36¼	39¼	31¾	19	22½	27	10
286	17½	57	62	68¾	73⅛	33¾	36¼	39¼	31¾	19	22½	27	10
287	17½	61⅜	66⅜	73⅛	77½	33¾	36¼	39¼	31¾	19	22½	27	10

Dimension "I" is distance between returns.
Dimension "N" is distance center to center of outlets.
Dimension "O" is diameter of smokepipe.

VOLUNTEER WATER BOILERS

NEW SERIES

DIMENSIONS

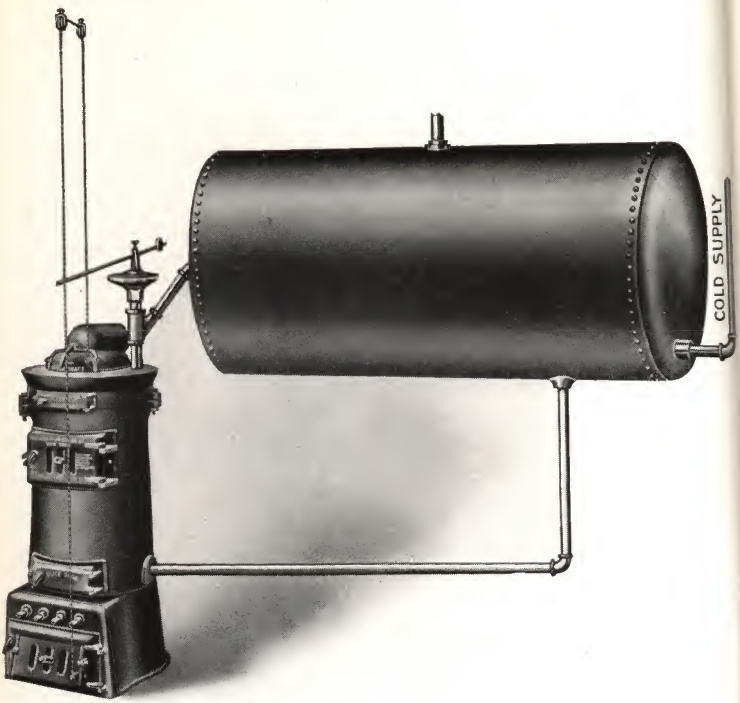


MEASUREMENTS ARE IN INCHES

No.	A	C	D	E	F	G	I	L	M	N	O
174	15¾	43½	48¼	53¼	23½	25⅝	21½	17	20½	19	7
175	15¾	47⅞	52⅝	57⅝	23½	25⅝	21½	17	20½	19	7
176	15¾	52¼	57	62	23½	25⅝	21½	17	20½	19	7
194	16¼	43½	47	54	25¼	27½	23½	17	20½	21	7
195	16¼	47⅞	53⅜	58⅜	25¼	27½	23½	17	20½	21	7
196	16¼	52¼	57¾	62¾	25¼	27½	23½	17	20½	21	7
224	17	43⅝	49¾	55⅛	28¾	31¼	26½	17	20½	24½	9
225	17	48¼	54⅜	59½	28¾	31¼	26½	17	20½	24½	9
226	17	52⅝	58½	63⅞	28¾	31¼	26½	17	20½	24½	9
227	17	57	62⅞	68⅛	28¾	31¼	26½	17	20½	24½	9
254	17	44¼	51	55½	31½	34¼	29¾	18	21½	27	9
255	17	48⅝	55⅜	59⅞	31½	34¼	29¾	18	21½	27	9
256	17	53	59¾	64¼	31½	34¼	29¾	18	21½	27	9
257	17	57⅜	64⅛	68⅝	31½	34¼	29¾	18	21½	27	9
284	17½	45½	52½	57¼	33¾	35⅞	31¾	19	22½	27	10
285	17½	49⅞	56⅞	61⅝	33¾	35⅞	31¾	19	22½	27	10
286	17½	54¼	61¾	66	33¾	35⅞	31¾	19	22½	27	10
287	17½	58⅝	65⅝	70⅜	33¾	35⅞	31¾	19	22½	27	10

Dimension "I" is distance between returns.
Dimension "N" is distance center to center of outlets.
Dimension "O" is diameter of smokepipe.

VOLUNTEER HOT WATER SUPPLY BOILERS AND STORAGE TANKS



The unit shown above, consisting of Volunteer Hot Water Supply Boiler connected to horizontal storage tank, is designed for supplying hot water in large quantities for domestic purposes.

The Page Metallic Sylphon Automatic Regulator insures a constant water temperature at any degree required.

VOLUNTEER HOT WATER SUPPLY BOILERS

No. 215 Volunteer

No. 315 Volunteer

CAPACITIES AND DIMENSIONS

Number of Boiler	Nominal Capacity Gallons per Hr.*	Actual Dia. Grate and Firepot, Inches	Area of Grate, Square Feet	Height to Top Outlets, Inches	Height Over All, Inches	Number and Size Outlets and Inlets, Inches	Dia. of Smoke Pipe, Inches
211	200	11	.66	33	37	2–1½	5
‡311	250	11	.66	38	42	2–1½	5
215	425	15	1.23	38	42	2–2	6
‡315	500	15	1.23	43½	50	2–2	6
‡317	600	17	1.58	45	52¼	2–2½	7
‡319	800	19	1.97	46	53½	2–2½	7

‡Consisting of firepot (with crownsheet) and water dome; others, firepot only.

*Temperature rise of 25 degrees per hour, on 8-hour firing period, using anthracite coal.

When Hot Water Supply Boilers are subjected to some unusual pressure, as when tanks are connected direct to city pumping station, it is recommended that the system be equipped with a water pressure reducing valve and relief valve.

MONARCH WATER TUBE BOILERS

THE Monarch Water Tube Steam and Hot Water Boilers as herein described represent the result of over seventy years' practical experience in the manufacture of heating apparatus, and are produced in a modern plant equipped with the latest improved machinery under the personal supervision of expert engineers.

They are designed for burning any kind of fuel; hard or soft coal, wood, gas, or oil—and their convenience in installing, ease of operation and economy are but a few of the many advantages that will be fully appreciated.

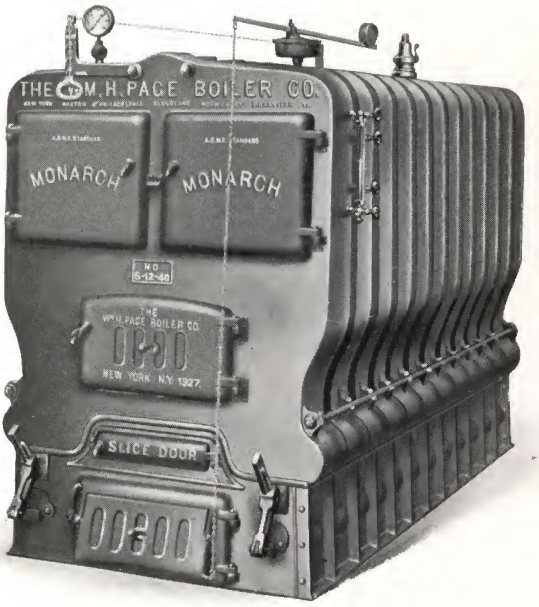
GRATE AND HEATING SURFACE

In the construction of these boilers particular attention was given to maintaining the proper ratio of grate to heating surface—which is a very important feature—expense was not considered, and our efforts resulted in providing boilers with more actual and effective surface than can be found in other forms of cast iron sectional boilers.

FIRE TRAVEL

A glance at the sectional view will give a comprehensive idea of the Monarch construction, showing the deep combustion chamber, sensitive water-ways and enormous amount of heating surface presented to the action of the fire, which combined with the long travel of the gases of combustion, three times back and forth through the boiler, utilize the largest percentage of the effective heat units, giving the highest efficiency with the most economical consumption of fuel.

MONARCH WATER TUBE BOILERS



40″ MONARCH WATER TUBE STEAM BOILER
BURNS ANY COAL, OIL OR GAS

GRATES REGULARLY FURNISHED ARE ADAPTED FOR BURNING ANY SIZE OF COAL, BUCKWHEAT OR LARGER

MONARCH CONNECTIONS

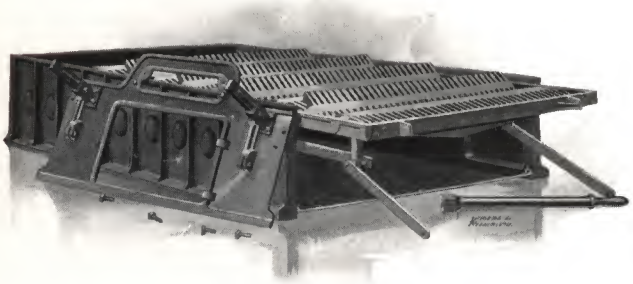
The Monarch is made with two forms of connections for joining the sections, one termed "Push nipple," consisting of heavy machine turned, smooth tapered nipples made of cast iron, the same as the boiler, and held together by heavy tie rods. The other is known as "Header" type, the sections being connected independently to a header or manifold by means of lock-nut threaded nipples. Neither connections are in any way exposed to the action of the fire, and are unaffected by expansion or contraction, and insure absolutely tight and permanent joints.

The push-nipple form is lower in height, which is a particularly advantageous feature where head room is deficient, obviating the necessity in shallow cellars of digging a pit in which to set the boiler. In all other respects both constructions are identical.

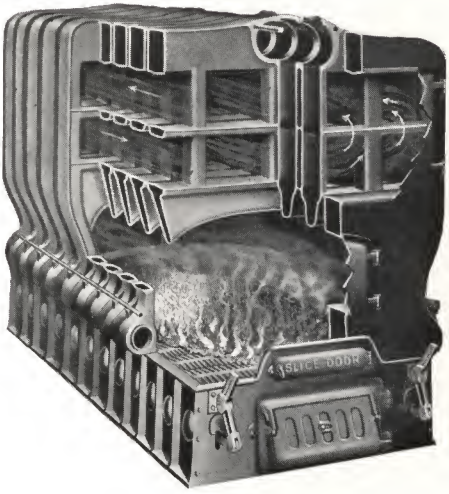
THE MONARCH GRATES

The Grate Bars are divided into two or more sections, each operated by a separate lever, thus permitting agitating the whole body of fire or only part of it.

By removing the front panel of the ashpit (see cut)



MONARCH WATER TUBE BOILERS



40″ MONARCH WATER TUBE BOILER

SHOWING DEEP COMBUSTION CHAMBER, LARGE AREA OF HEATING SURFACE AND LONG THREE-WAY FIRE TRAVEL.

GRATES REGULARLY FURNISHED ARE ADAPTED FOR BURNING ANY SIZE OF COAL, BUCKWHEAT OR LARGER

the entire grate frame can be withdrawn, giving free access to every part of the grate.

An excellent feature of the Monarch ashpit is, that when adding sections to the boiler, new sections can be also added to the ashpit, obviating the necessity of an entire new ashpit.

EASE OF CLEANING

Monarch Boilers, being equipped with large front and rear clean-out doors, give free and easy access to every part of the fire surface, thus permitting thorough cleaning of all interior parts of the boiler. This is a very essential feature, as in order to obtain full efficiency and economy these surfaces should be kept clean.

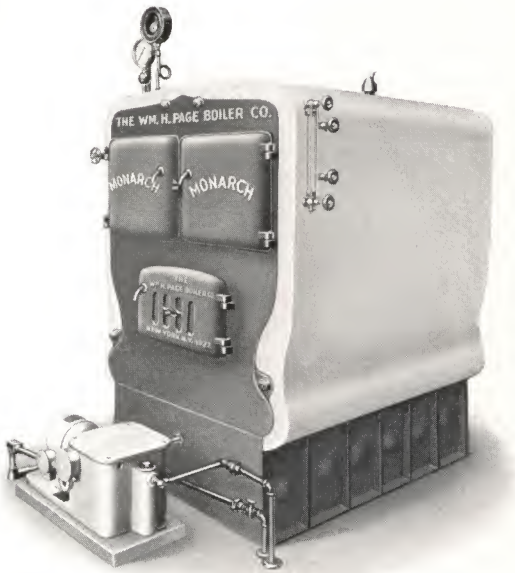
INCREASE OF CAPACITY

All Monarch Steam and Water Boilers are made on the unit or sectional principle, and their capacity can be increased or diminished by adding to or taking from the number of sections. Therefore, should the building be enlarged at any time after boiler is installed, its capacity can be increased by the addition of more sections to meet the requirements.

EXCEPTIONALLY EFFICIENT FOR OIL-BURNING

Because the sectional construction of Monarch Boilers will permit of their being made up into long sizes, with the resulting longer fire travel, they lend themselves admirably to use with oil-burners, exceptional efficiency and economy being attained.

MONARCH WATER TUBE BOILERS



MONARCH STEAM BOILER
EQUIPPED FOR OIL-BURNING

MONARCH WATER TUBE BOILERS

Ratings and Dimensions

STEAM

No.	Rating Sq. Ft. Steam	‡Size of Grate, Inches	‡Full Area of Grate, Sq. Ft.	Water Line, Inches	Outlets and Inlets, Inches	Length, Inches "G"	Chimney Flue Dimensions Inches	Height of Chimney Flue, Feet
S- 4-22	850	22 x 20	3.06	41	2–3	27 3/8	12 x 12	35
S- 5-22	1075	22 x 26 3/8	4.03	41	2–3	33 7/8	12 x 12	40
S- 6-22	1300	22 x 32 3/4	5.00	41	2–3	39 7/8	12 x 12	40
S- 7-22	1525	22 x 39 3/8	5.98	41	2–3	46 3/8	12 x 12	40
S- 8-22	1750	22 x 45 1/2	6.95	41	2–3	52 1/4	12 x 16	40
S- 4-28	1600	28 x 24 3/4	4.82	51	2–5	35 3/8	12 x 16	40
S- 5-28	2100	28 x 33 1/8	6.45	51	2–5	43 3/8	12 x 16	40
S- 6-28	2600	28 x 41 1/2	8.07	51	2–5	51 3/4	12 x 16	40
S- 7-28	3100	28 x 49 7/8	9.70	51	2–5	60 1/4	16 x 16	45
S- 8-28	3600	28 x 58 1/4	11.32	51	2–5	69	16 x 16	45
S- 9-28	4100	28 x 66 5/8	12.96	51	2–5	77 1/8	16 x 20	50
S-10-28	4600	28 x 66 5/8	‡14.58	51	2–5	85 1/4	16 x 20	50
S-11-28	5100	28 x 66 5/8	‡16.21	51	2–5	94	20 x 20	55
S-12-28	5600	28 x 66 5/8	‡17.84	51	2–5	101 7/8	20 x 20	55
S- 5-40	3400	40 x 33 1/8	9.20	58	2–5	43 3/8	16 x 16	45
S- 6-40	4200	40 x 41 1/2	11.52	58	2–5	51 3/4	16 x 20	50
S- 7-40	5000	40 x 49 7/8	13.85	58	2–5	60 1/4	20 x 20	55
S- 8-40	5800	40 x 58 1/4	16.18	58	2–5	69	20 x 24	60
S- 9-40	6600	40 x 66 5/8	18.50	58	2–5	77 1/8	24 x 24	65
S-10-40	7400	40 x 75	20.82	58	2–5	85 1/4	24 x 24	65
S-11-40	8200	40 x 83 3/8	23.13	58	3–5	94	24 x 28	65
S-12-40	9000	40 x 91 3/4	25.50	58	3–5	101 7/8	28 x 28	70
S-13-40	9800	40 x 91 3/4	‡27.81	58	3–5	110 1/4	28 x 28	70
S-14-40	10600	40 x 91 3/4	‡30.14	58	3–5	118 3/4	28 x 32	70
S-15-40	11400	40 x 91 3/4	‡32.47	58	3–5	127 1/2	28 x 32	70
S-16-40	12200	40 x 91 3/4	‡34.79	58	3–5	135 5/8	28 x 32	70
S- 6-60	6600	60 x 41 1/2	17.29	60	2–6	51 3/4	24 x 24	60
S- 7-60	8200	60 x 49 7/8	20.78	60	2–6	60 1/4	24 x 24	60
S- 8-60	9800	60 x 58 1/4	24.27	60	2–6	69	24 x 24	65
S- 9-60	11400	60 x 66 5/8	27.76	60	3–6	77 1/8	24 x 28	65
S-10-60	13000	60 x 66 5/8	‡31.25	60	3–6	85 1/4	24 x 28	70
S-11-60	14600	60 x 66 5/8	‡34.74	60	3–6	94	28 x 28	70
S-12-60	16200	60 x 75	‡38.22	60	3–6	101 7/8	28 x 28	75
S-13-60	17800	60 x 75	‡41.72	60	3–6	110 1/4	28 x 28	80
S-14-60	19400	60 x 75	‡45.20	60	3–6	118 3/4	28 x 32	80
S-15-60	21000	60 x 83 3/8	‡48.69	60	3–6	127 1/2	28 x 32	80
S-16-60	22600	60 x 83 3/8	‡52.18	60	3–6	135 5/8	28 x 32	85
S-17-60	24200	60 x 83 3/8	‡55.67	60	3–6	143 3/4	32 x 32	85
S-18-60	25800	60 x 91 3/4	‡59.16	60	3–6	152 3/8	32 x 32	85
S-19-60	27400	60 x 91 3/4	‡62.65	60	3–6	160 3/8	32 x 32	90
S-20-60	29000	60 x 91 3/4	‡66.14	60	3–6	168 3/4	32 x 32	90

Size of Smokepipe: 22 Series, 13 inches; 28 Series, 16 inches; 40 Series, 21 inches; 60 Series, 26 inches.

Monarch Boilers are built in conformity with the Boiler Code of the American Society of Mechanical Engineers.

Ratings, as given, are derived from tests made in accordance with the American Society of Heating and Ventilating Engineers' Low-Pressure Boiler Code.

Ratings are based on a standard of 2 pounds pressure maintained at the boiler.

All piping (mains and risers, flows and returns) is to be figured as radiating surface in addition to the direct and indirect radiation attached to same.

‡Grate areas are for entire length of firebox, but, unless otherwise ordered, these boilers will be shipped with bridgewall section to reduce grate to length in table of dimensions above.

For complete table of dimensions, see pages 54 and 55.

MONARCH WATER TUBE BOILERS

Ratings and Dimensions

WATER

No.	Rating Sq. Ft. Water	‡Size of Grate, Inches	‡Full Area of Grate, Sq. Ft.	Outlets and Inlets, Inches	Length, Inches "G"	Chimney Flue Dimensions, Inches	Height of Chimney Flue, Feet
W- 4-22	1400	22 x 20	3.06	2-3	27 3/8	12 x 12	35
W- 5-22	1775	22 x 26 3/8	4.03	2-3	33 7/8	12 x 12	40
W- 6-22	2150	22 x 32 3/4	5.00	2-3	39 7/8	12 x 12	40
W- 7-22	2525	22 x 39 1/8	5.98	2-3	46 3/8	12 x 12	40
W- 8-22	2900	22 x 45 1/2	6.95	2-3	52 1/4	12 x 16	40
W- 4-28	2650	28 x 24 3/4	4.82	2-5	35 3/8	12 x 16	40
W- 5-28	3475	28 x 33 1/8	6.45	2-5	43 3/8	12 x 16	40
W- 6-28	4300	28 x 41 1/2	8.07	2-5	51 3/4	12 x 16	40
W- 7-28	5125	28 x 49 7/8	9.70	2-5	60 1/4	16 x 16	45
W- 8-28	5950	28 x 58 1/4	11.32	2-5	69	16 x 16	45
W- 9-28	6775	28 x 66 5/8	12.96	2-5	77 1/8	16 x 20	50
W-10-28	7600	28 x 66 5/8	‡14.58	2-5	85 1/4	16 x 20	50
W-11-28	8425	28 x 66 5/8	‡16.21	2-5	94	20 x 20	55
W-12-28	9250	28 x 66 5/8	‡17.84	2-5	101 7/8	20 x 20	55
W- 5-40	5600	40 x 33 1/8	9.20	2-5	43 3/8	16 x 16	45
W- 6-40	6925	40 x 41 1/2	11.52	2-5	51 3/4	16 x 20	50
W- 7-40	8250	40 x 49 7/8	13.85	2-5	60 1/4	20 x 20	55
W- 8-40	9575	40 x 58 1/4	16.18	2-5	69	20 x 24	60
W- 9-40	10900	40 x 66 5/8	18.50	2-5	77 1/8	24 x 24	65
W-10-40	12200	40 x 75	20.82	2-5	85 1/4	24 x 24	65
W-11-40	13525	40 x 83 3/8	23.13	3-5	94	24 x 28	65
W-12-40	14850	40 x 91 3/4	25.50	3-5	101 7/8	28 x 28	70
W-13-40	16175	40 x 91 3/4	‡27.81	3-5	110 1/4	28 x 28	70
W-14-40	17500	40 x 91 3/4	‡30.14	3-5	118 3/4	28 x 32	70
W-15-40	18800	40 x 91 3/4	‡32.47	3-5	127 1/2	28 x 32	70
W-16-40	20125	40 x 91 3/4	‡34.79	3-5	135 5/8	28 x 32	70
W- 6-60	10900	60 x 41 1/2	17.29	2-6	51 3/4	24 x 24	60
W- 7-60	13525	60 x 49 7/8	20.78	2-6	60 1/4	24 x 24	60
W- 8-60	16175	60 x 58 1/4	24.27	2-6	69	24 x 24	65
W- 9-60	18800	60 x 66 5/8	27.76	3-6	77 1/8	24 x 28	65
W-10-60	21450	60 x 66 5/8	‡31.25	3-6	85 1/4	24 x 28	70
W-11-60	24100	60 x 66 5/8	‡34.74	3-6	94	28 x 28	70
W-12-60	26725	60 x 75	‡38.22	3-6	101 7/8	28 x 28	75
W-13-60	29375	60 x 75	‡41.72	3-6	110 1/4	28 x 28	80
W-14-60	32000	60 x 75	‡45.20	3-6	118 3/4	28 x 32	80
W-15-60	34650	60 x 83 3/8	‡48.69	3-6	127 1/2	28 x 32	80
W-16-60	37300	60 x 83 3/8	‡52.18	3-6	135 5/8	28 x 32	85
W-17-60	39950	60 x 83 3/8	‡55.67	3-6	143 3/4	32 x 32	85
W-18-60	42600	60 x 91 3/4	‡59.16	3-6	152 3/8	32 x 32	85
W-19-60	45200	60 x 91 3/4	‡62.65	3-6	160 3/8	32 x 32	90
W-20-60	47850	60 x 91 3/4	‡66.14	3-6	168 3/4	32 x 32	90

Size of Smokepipe: 22 Series, 13 inches; 28 Series, 16 inches; 40 Series, 21 inches; 60 Series, 26 inches.

Monarch Boilers are built in conformity with the Boiler Code of the American Society of Mechanical Engineers.

Ratings, as given, are derived from tests made in accordance with the American Society of Heating and Ventilating Engineers' Low-Pressure Boiler Code.

Ratings are based on a standard of 180 degrees at the boiler.

All piping (mains and risers, flows and returns) is to be figured as radiating surface in addition to the direct and indirect radiation attached to same.

‡Grate areas are for entire length of firebox, but, unless otherwise ordered, these boilers will be shipped with bridgewall section to reduce grate to length in table of dimensions above.

For complete table of dimensions, see pages 54 and 55.

MONARCH WATER TUBE BOILERS

HEADER TYPE

Ratings and Dimensions

STEAM

No.	Rating Sq. Ft. Steam	‡Size of Grate, Inches	‡Full Area of Grate, Sq. Ft.	Water Line, Inches	Outlets and Inlets, Inches	Length, Inches "G"	Chimney Flue Dimensions Inches	Height of Chimney Flue, Feet
S-H- 4-22	850	22 x 20	3.06	41	2–3	27 3/8	12 x 12	35
S-H- 5-22	1075	22 x 26 3/8	4.03	41	2–3	33 7/8	12 x 12	40
S-H- 6-22	1300	22 x 32 3/4	5.00	41	2–3	39 7/8	12 x 12	40
S-H- 7-22	1525	22 x 39 1/8	5.98	41	2–3	46 3/8	12 x 12	40
S-H- 8-22	1750	22 x 45 1/2	6.95	41	2–3	52 1/4	12 x 16	40
S-H- 4-28	1600	28 x 24 3/4	4.82	51	2–5	35 3/8	12 x 16	40
S-H- 5-28	2100	28 x 33 1/8	6.45	51	2–5	43 3/8	12 x 16	40
S-H- 6-28	2600	28 x 41 1/2	8.07	51	2–5	51 3/4	12 x 16	40
S-H- 7-28	3100	28 x 49 7/8	9.70	51	2–5	60 1/4	16 x 16	45
S-H- 8-28	3600	28 x 58 1/4	11.32	51	2–5	69	16 x 16	45
S-H- 9-28	4100	28 x 66 5/8	12.96	51	2–5	77 1/8	16 x 20	50
S-H-10-28	4600	28 x 66 5/8	‡14.58	51	2–5	85 1/4	16 x 20	50
S-H-11-28	5100	28 x 66 5/8	‡16.21	51	2–5	94	20 x 20	55
S-H-12-28	5600	28 x 66 5/8	‡17.84	51	2–5	101 7/8	20 x 20	55
S-H- 5-40	3400	40 x 33 1/8	9.20	58	2–5	43 3/8	16 x 16	45
S-H- 6-40	4200	40 x 41 1/2	11.52	58	2–5	51 3/4	16 x 20	50
S-H- 7-40	5000	40 x 49 7/8	13.85	58	2–5	60 1/4	20 x 20	55
S-H- 8-40	5800	40 x 58 1/4	16.18	58	2–5	69	20 x 24	60
S-H- 9-40	6600	40 x 66 5/8	18.50	58	2–5	77 1/8	24 x 24	65
S-H-10-40	7400	40 x 75	20.82	58	2–5	85 1/4	24 x 24	65
S-H-11-40	8200	40 x 83 3/8	23.13	58	3–5	94	24 x 28	65
S-H-12-40	9000	40 x 91 3/4	25.50	58	3–5	101 7/8	28 x 28	70
S-H-13-40	9800	40 x 91 3/4	‡27.81	58	3–5	110 1/4	28 x 28	70
S-H-14-40	10600	40 x 91 3/4	‡30.14	58	3–5	118 3/4	28 x 32	70
S-H-15-40	11400	40 x 91 3/4	‡32.47	58	3–5	127 1/2	28 x 32	70
S-H-16-40	12200	40 x 91 3/4	‡34.79	58	3–5	135 5/8	28 x 32	70

Size of Smokepipe: 22 Series, 13 inches; 28 Series, 16 inches; 40 Series, 21 inches.

Monarch Boilers are built in conformity with the Boiler Code of the American Society of Mechanical Engineers.

Ratings, as given, are derived from tests made in accordance with the American Society of Heating and Ventilating Engineers' Low-Pressure Boiler Code.

Ratings are based on a standard of 2 pounds pressure maintained at the boiler.

All piping (mains and risers, flows and returns) is to be figured as radiating surface in addition to the direct and indirect radiation attached to same.

‡Grate areas are for entire length of firebox, but, unless otherwise ordered, these boilers will be shipped with bridgewall section to reduce grate to length in table of dimensions above.

For complete table of dimensions, see pages 56 and 57.

MONARCH WATER TUBE BOILERS

HEADER TYPE

Ratings and Dimensions

WATER

No.	Rating Sq. Ft. Water	‡Size of Grate, Inches	‡Full Area of Grate, Sq. Ft.	Outlets and Inlets, Inches	Length, Inches "G"	Chimney Flue Dimensions Inches	Height of Chimney Flue, Feet
W-H- 4-22	1400	22 x 20	3.06	2–3	27 3/8	12 x 12	35
W-H- 5-22	1775	22 x 26 3/8	4.03	2–3	33 7/8	12 x 12	40
W-H- 6-22	2150	22 x 32 3/4	5.00	2–3	39 7/8	12 x 12	40
W-H- 7-22	2525	22 x 39 1/8	5.98	2–3	46 3/8	12 x 12	40
W-H- 8-22	2900	22 x 45 1/2	6.95	2–3	52 1/4	12 x 16	40
W-H- 4-28	2650	28 x 24 3/4	4.82	2–5	35 3/8	12 x 16	40
W-H- 5-28	3475	28 x 33 1/8	6.45	2–5	43 3/8	12 x 16	40
W-H- 6-28	4300	28 x 41 1/2	8.07	2–5	51 3/4	12 x 16	40
W-H- 7-28	5125	28 x 49 7/8	9.70	2–5	60 1/4	16 x 16	45
W-H- 8-28	5950	28 x 58 1/4	11.32	2–5	69	16 x 16	45
W-H- 9-28	6775	28 x 66 5/8	12.96	2–5	77 1/8	16 x 20	50
W-H-10-28	7600	28 x 66 5/8	‡14.58	2–5	85 1/4	16 x 20	50
W-H-11-28	8425	28 x 66 5/8	‡16.21	2–5	94	20 x 20	55
W-H-12-28	9250	28 x 66 5/8	‡17.84	2–5	101 7/8	20 x 20	55
W-H- 5-40	5600	40 x 33 1/8	9.20	2–5	43 3/8	16 x 16	45
W-H- 6-40	6925	40 x 41 1/2	11.52	2–5	51 3/4	16 x 20	50
W-H- 7-40	8250	40 x 49 7/8	13.85	2–5	60 1/4	20 x 20	55
W-H- 8-40	9575	40 x 58 1/4	16.18	2–5	69	20 x 24	60
W-H- 9-40	10900	40 x 66 5/8	18.50	2–5	77 1/8	24 x 24	65
W-H-10-40	12200	40 x 75	20.82	2–5	85 1/4	24 x 24	65
W-H-11-40	13525	40 x 83 3/8	23.13	3–5	94	24 x 28	65
W-H-12-40	14850	40 x 91 3/4	25.50	3–5	101 7/8	28 x 28	70
W-H-13-40	16175	40 x 91 3/4	‡27.81	3–5	110 1/4	28 x 28	70
W-H-14-40	17500	40 x 91 3/4	‡30.14	3–5	118 3/4	28 x 32	70
W-H-15-40	18800	40 x 91 3/4	‡32.47	3–5	127 1/2	28 x 32	70
W-H-16-40	20125	40 x 91 3/4	‡34.79	3–5	135 5/8	28 x 32	70

Size of Smokepipe: 22 Series, 13 inches; 28 Series, 16 inches; 40 Series, 21 inches.

Monarch Boilers are built in conformity with the Boiler Code of the American Society of Mechanical Engineers.

Ratings, as given, are derived from tests made in accordance with the American Society of Heating and Ventilating Engineers' Low-Pressure Boiler Code.

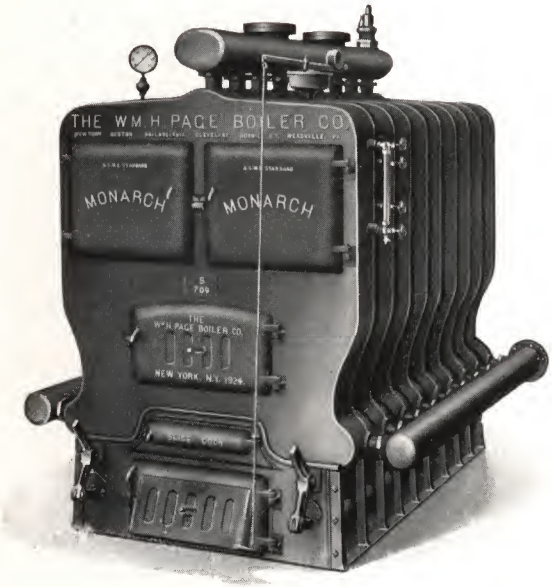
Ratings are based on a standard of 180 degrees at the boiler.

All piping (mains and risers, flows and returns) is to be figured as radiating surface in addition to the direct and indirect radiation attached to same.

‡Grate areas are for entire length of firebox, but, unless otherwise ordered, these boilers will be shipped with bridgewall section to reduce grate to length in table of dimensions above.

For complete table of dimensions, see pages 56 and 57.

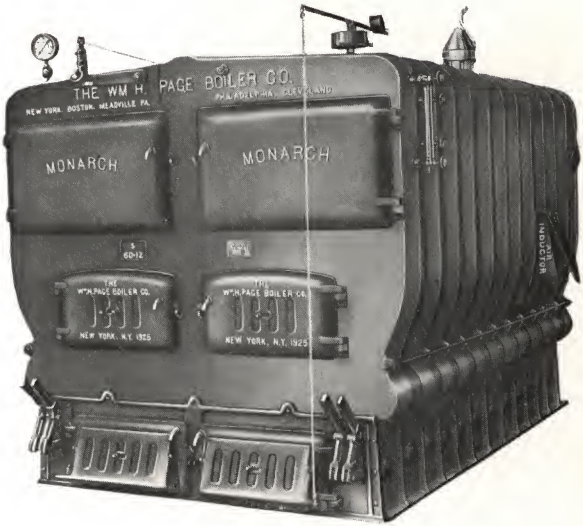
MONARCH WATER TUBE BOILERS



40″ MONARCH STEAM BOILER, HEADER TYPE
BURNS ANY COAL, OIL OR GAS

GRATES REGULARLY FURNISHED ARE ADAPTED FOR BURNING ANY SIZE OF COAL, BUCKWHEAT OR LARGER

MONARCH SMOKELESS BOILERS



60″ MONARCH SMOKELESS STEAM BOILER

GRATES REGULARLY FURNISHED ARE ADAPTED FOR BURNING SOFT COAL, AND ANY SIZE OF HARD COAL, BUCKWHEAT OR LARGER

MONARCH SMOKELESS BOILERS

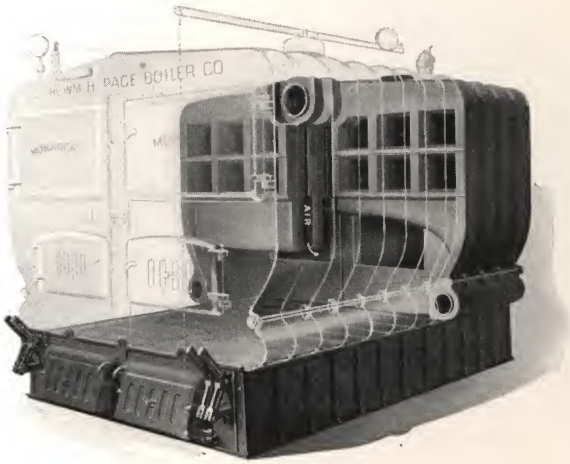
BURN SOFT COAL, HARD COAL OR COKE

THERE is an increasing demand for a heating boiler that will burn soft or bituminous coal without smoke. This demand has been brought about by the increased use of soft coal, due to the high cost or inadequate supply of hard or anthracite coal.

The emission of smoke is a sure indication of imperfect combustion, showing that the rich gases from the products of combustion are not being thoroughly consumed, escaping unburned up the chimney, as is evidenced where soft coal is burned in the ordinary boiler, it being impractical in such types to supply the rapidly liberated gases with sufficient air through the grate to ignite and consume them thoroughly, resulting in a large percentage of the fuel being wasted, going forth in form of smoke, injurious to health, the building and surroundings, and this has compelled most cities and towns to adopt rigid anti-smoke ordinances.

In the Monarch Smokeless Boiler, the products of combustion rise in the firebox, coming in contact with the valuable direct overhanging fire surface, thence passing to the rear or secondary combustion chamber, where air from both sides of the boiler is admitted through the air inductor over the fuel bed, producing a mixture of proper proportions for complete combustion before the gases, now fully ignited, turn and pass through the lower tier of flues to the front of the boiler and back to the chimney through the upper tier, the heat units thereby released being absorbed by the heating surfaces of the flues, and all combustibles completely consumed before leaving the boiler, absolutely eliminating all smoke, even with the cheapest grades of soft coal.

MONARCH SMOKELESS BOILERS



60″ MONARCH SMOKELESS BOILER

PHANTOM VIEW SHOWING ARRANGEMENT OF AUXILIARY AIR INDUCTOR, PRIMARY AND SECONDARY COMBUSTION CHAMBERS AND NIPPLE CONNECTIONS

GRATES REGULARLY FURNISHED ARE ADAPTED FOR BURNING SOFT COAL, AND ANY SIZE OF HARD COAL, BUCKWHEAT OR LARGER

The Monarch Smokeless Boiler not only burns any grade of soft coal smokelessly, but effects a saving of 25% to 33⅓% without the skilled care and excessive attention required in other constructions.

The Monarch Smokeless Boiler, while primarily designed for burning soft coal, is also adapted for burning hard coal, coke, wood, oil or gas, with high efficiency and economy. Fuel shortages experienced in the past emphasize the advantage of this convertibility.

U. S. GOVERNMENT—DEPARTMENT OF THE INTERIOR

Technical Bulletin No. 139. Pages 7 to 10

In a hand-fired furnace about one-half of the combustion takes place in the fuel bed and one-half in the combustion space.

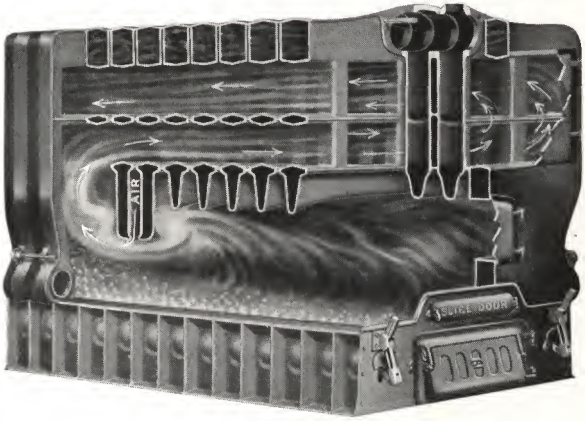
The burning fuel bed acts principally as a gas producer and a gas retort; in it the solid fuel is gasified by the partial combustion of the fixed carbon and by the distillation of the volatile matter.

The gases rising from the fuel bed contain at times as much as 32 per cent combustible, and no free oxygen to burn it. Hence, to burn these gases, air must be admitted over the fuel bed and mixed with the combustible, and the mixture burned in the combustion space. Of the air necessary to complete combustion of the fuel, only about one-half can be supplied through the grate; the other half must be supplied over the fuel bed.

If attempt is made to force more than this amount of air through the grate, only the rate of gasification of coal in the fuel bed is increased, while the degree of completeness of combustion as indicated by the composition of the gases leaving the fuel bed remains the same. The combustion can be completed in the combustion space only by adding enough air over the fuel bed and mixing it with the combustible.

This is *exactly* what has been accomplished in the Monarch Smokeless Boiler.

MONARCH SMOKELESS BOILERS



40″ MONARCH SMOKELESS BOILER

CUTAWAY VIEW SHOWING THREE-WAY FIRE TRAVEL, AUXILIARY AIR INDUCTOR, AND PRIMARY AND SECONDARY COMBUSTION CHAMBERS

GRATES REGULARLY FURNISHED ARE ADAPTED FOR BURNING SOFT COAL, AND ANY SIZE OF HARD COAL, BUCKWHEAT OR LARGER

†MONARCH SMOKELESS BOILERS

Ratings and Dimensions

STEAM

No.	Rating Sq. Ft. Steam	‡Size of Grate, Inches	‡Full Area of Grate, Sq. Ft.	Water Line, Inches	Outlets and Inlets, Inches	Length, Inches "G"	Chimney Flue Dimensions Inches	Height of Chimney Flue, Feet
S-22-5	1075	22 x 26⅜	4.03	41	2–3	33⅞	12 x 12	40
S-22-6	1300	22 x 32¾	5.00	41	2–3	39⅞	12 x 12	40
S-22-7	1525	22 x 39⅜	5.98	41	2–3	46⅜	12 x 12	40
S-22-8	1750	22 x 45½	6.95	41	2–3	52¼	12 x 16	40
S-28-5	2100	28 x 33⅜	6.45	51	2–5	43⅜	12 x 16	40
S-28-6	2600	28 x 41½	8.07	51	2–5	51¾	12 x 16	40
S-28-7	3100	28 x 49⅞	9.70	51	2–5	60¼	16 x 16	45
S-28-8	3600	28 x 49⅞	‡11.32	51	2–5	69	16 x 16	45
S-28-9	4100	28 x 58¼	‡12.96	51	2–5	77⅛	16 x 20	50
S-28-10	4600	28 x 58¼	‡14.58	51	2–5	85¼	16 x 20	50
S-28-11	5100	28 x 66⅝	‡16.21	51	2–5	94	20 x 20	55
S-28-12	5600	28 x 66⅝	‡17.84	51	2–5	101⅞	20 x 20	55
S-40-5	3400	40 x 33⅜	9.20	58	2–5	43⅜	16 x 16	45
S-40-6	4200	40 x 41½	11.52	58	2–5	51¾	16 x 20	50
S-40-7	5000	40 x 49⅞	13.85	58	2–5	60¼	20 x 20	55
S-40-8	5800	40 x 58¼	16.18	58	2–5	69	20 x 24	60
S-40-9	6600	40 x 58¼	‡18.50	58	2–5	77⅛	24 x 24	65
S-40-10	7400	40 x 66⅝	‡20.82	58	2–5	85¼	24 x 24	65
S-40-11	8200	40 x 66⅝	‡23.13	58	3–5	94	24 x 28	65
S-40-12	9000	40 x 66⅝	‡25.50	58	3–5	101⅞	28 x 28	70
S-40-13	9800	40 x 75	‡27.81	58	3–5	110¼	28 x 28	70
S-40-14	10600	40 x 75	‡30.14	58	3–5	118¾	28 x 32	70
S-40-15	11400	40 x 83⅜	‡32.47	58	3–5	127½	28 x 32	70
S-40-16	12200	40 x 83⅜	‡34.79	58	3–5	135⅝	28 x 32	70
S-40-17	13000	40 x 91¾	‡37.12	58	3–5	143¾	32 x 32	75
S-40-18	13800	40 x 91¾	‡39.44	58	3–5	152⅜	32 x 32	75
S-40-19	14600	40 x 91¾	‡41.77	58	3–5	160⅜	32 x 32	75
S-40-20	15400	40 x 91¾	‡44.10	58	3–5	168¾	32 x 32	75
S-60-7	8200	60 x 49⅞	20.78	60	2–6	60¼	24 x 24	60
S-60-8	9800	60 x 58¼	24.27	60	2–6	69	24 x 24	65
S-60-9	11400	60 x 66⅝	27.76	60	3–6	77⅛	24 x 28	65
S-60-10	13000	60 x 66⅝	‡31.25	60	3–6	85¼	24 x 28	70
S-60-11	14600	60 x 66⅝	‡34.74	60	3–6	94	28 x 28	70
S-60-12	16200	60 x 75	‡38.22	60	3–6	101⅞	28 x 28	75
S-60-13	17800	60 x 75	‡41.72	60	3–6	110¼	28 x 28	80
S-60-14	19400	60 x 75	‡45.20	60	3–6	118¾	28 x 32	80
S-60-15	21000	60 x 83⅜	‡48.69	60	3–6	127½	28 x 32	80
S-60-16	22600	60 x 83⅜	‡52.18	60	3–6	135⅝	28 x 32	85
S-60-17	24200	60 x 83⅜	‡55.67	60	3–6	143¾	32 x 32	85
S-60-18	25800	60 x 91¾	‡59.16	60	3–6	152⅜	32 x 32	85
S-60-19	27400	60 x 91¾	‡62.65	60	3–6	160⅜	32 x 32	90
S-60-20	29000	60 x 91¾	‡66.14	60	3–6	168¾	32 x 32	90

Size of Smokepipe: 22 Series, 13 inches; 28 Series, 16 inches; 40 Series, 21 inches; 60 Series, 26 inches.

Monarch Smokeless Boilers are built in conformity with the Boiler Code of the American Society of Mechanical Engineers.

†These boilers, excepting the 60 Series, can also be furnished in Header Type.

Ratings, as given, are derived from tests made in accordance with the American Society of Heating and Ventilating Engineers' Low-Pressure Boiler Code.

Ratings are based on a standard of 2 pounds pressure maintained at the boiler.

All piping (mains and risers, flows and returns) is to be figured as radiating surface in addition to the direct and indirect radiation attached to same.

‡Grate areas are for entire length of firebox, but, unless otherwise ordered, these boilers will be shipped with bridgewall section to reduce grate to length in table of dimensions above.

For complete table of dimensions, see pages 54 to 57.

†MONARCH SMOKELESS BOILERS

Ratings and Dimensions

WATER

No.	Rating Sq. Ft. Water	‡Size of Grate, Inches	‡Full Area of Grate, Sq. Ft.	Outlets and Inlets, Inches	Length, Inches "G"	Chimney Flue Dimensions Inches	Height of Chimney Flue, Feet
W-22-5	1775	22 x 26 3/8	4.03	2–3	33 7/8	12 x 12	40
W-22-6	2150	22 x 32 3/4	5.00	2–3	39 7/8	12 x 12	40
W-22-7	2525	22 x 39 1/8	5.98	2–3	46 3/8	12 x 12	40
W-22-8	2900	22 x 45 1/2	6.95	2–3	52 1/4	12 x 16	40
W-28-5	3475	28 x 33 1/8	6.45	2–5	43 3/8	12 x 16	40
W-28-6	4300	28 x 41 1/2	8.07	2–5	51 3/4	12 x 16	40
W-28-7	5125	28 x 49 7/8	9.70	2–5	60 1/4	16 x 16	45
W-28-8	5950	28 x 49 7/8	‡11.32	2–5	69	16 x 16	45
W-28-9	6775	28 x 58 1/4	‡12.96	2–5	77 1/8	16 x 20	50
W-28-10	7600	28 x 58 1/4	‡14.58	2–5	85 1/4	16 x 20	50
W-28-11	8425	28 x 66 5/8	‡16.21	2–5	94	20 x 20	55
W-28-12	9250	28 x 66 5/8	‡17.84	2–5	101 7/8	20 x 20	55
W-40-5	5600	40 x 33 1/8	9.20	2–5	43 3/8	16 x 16	45
W-40-6	6925	40 x 41 1/2	11.52	2–5	51 3/4	16 x 20	50
W-40-7	8250	40 x 49 7/8	13.85	2–5	60 1/4	20 x 20	55
W-40-8	9575	40 x 58 1/4	16.18	2–5	69	20 x 24	60
W-40-9	10900	40 x 58 1/4	‡18.50	2–5	77 1/8	24 x 24	65
W-40-10	12200	40 x 66 5/8	‡20.82	2–5	85 1/4	24 x 24	65
W-40-11	13525	40 x 66 5/8	‡23.13	3–5	94	24 x 28	65
W-40-12	14850	40 x 66 5/8	‡25.50	3–5	101 7/8	28 x 28	70
W-40-13	16175	40 x 75	‡27.81	3–5	110 1/4	28 x 28	70
W-40-14	17500	40 x 75	‡30.14	3–5	118 3/4	28 x 32	70
W-40-15	18800	40 x 83 3/8	‡32.47	3–5	127 1/2	28 x 32	70
W-40-16	20125	40 x 83 3/8	‡34.79	3–5	135 5/8	28 x 32	70
W-40-17	21450	40 x 91 3/4	‡37.12	3–5	143 3/4	32 x 32	75
W-40-18	22775	40 x 91 3/4	‡39.44	3–5	152 3/8	32 x 32	75
W-40-19	24100	40 x 91 3/4	‡41.77	3–5	160 3/8	32 x 32	75
W-40-20	25400	40 x 91 3/4	‡44.10	3–5	168 3/4	32 x 32	75
W-60-7	13525	60 x 49 7/8	20.78	2–6	60 1/4	24 x 24	60
W-60-8	16175	60 x 58 1/4	24.27	2–6	69	24 x 24	65
W-60-9	18800	60 x 66 5/8	27.76	3–6	77 1/8	24 x 28	65
W-60-10	21450	60 x 66 5/8	‡31.25	3–6	85 1/4	24 x 28	70
W-60-11	24100	60 x 66 5/8	‡34.74	3–6	94	28 x 28	70
W-60-12	26725	60 x 75	‡38.22	3–6	101 7/8	28 x 28	75
W-60-13	29375	60 x 75	‡41.72	3–6	110 1/4	28 x 28	80
W-60-14	32000	60 x 75	‡45.20	3–6	118 3/4	28 x 32	80
W-60-15	34650	60 x 83 3/8	‡48.69	3–6	127 1/2	28 x 32	80
W-60-16	37300	60 x 83 3/8	‡52.18	3–6	135 5/8	28 x 32	85
W-60-17	39950	60 x 83 3/8	‡55.67	3–6	143 3/4	32 x 32	85
W-60-18	42600	60 x 91 3/4	‡59.16	3–6	152 3/8	32 x 32	85
W-60-19	45200	60 x 91 3/4	‡62.65	3–6	160 3/8	32 x 32	90
W-60-20	47850	60 x 91 3/4	‡66.14	3–6	168 3/4	32 x 32	90

Size of Smokepipe: 22 Series, 13 inches; 28 Series, 16 inches; 40 Series, 21 inches 60 Series, 26 inches.

Monarch Smokeless Boilers are built in conformity with the Boiler Code of the American Society of Mechanical Engineers.

†These boilers, excepting the 60 Series, can also be furnished in Header Type.

Ratings, as given, are derived from tests made in accordance with the American Society of Heating and Ventilating Engineers' Low-Pressure Boiler Code.

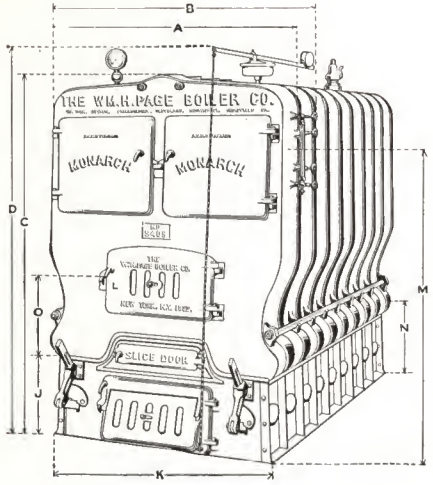
Ratings are based on a standard of 180 degrees at the boiler.

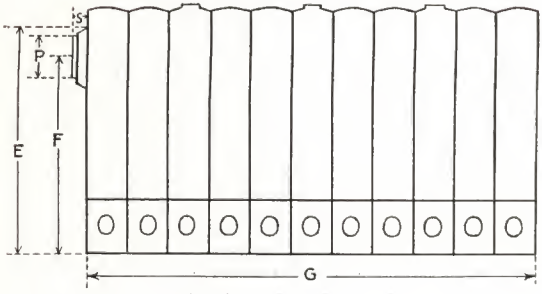
All piping (mains and risers, flows and returns) is to be figured as radiating surface in addition to the direct and indirect radiation attached to same.

‡Grate areas are for entire length of firebox, but, unless otherwise ordered, these boilers will be shipped with bridgewall section to reduce grate to length in table of dimensions above.

For complete table of dimensions, see pages 54 to 57.

MONARCH WATER TUBE BOILERS





MONARCH WATER TUBE BOILER DIMENSIONS

REGULAR AND SMOKELESS TYPES

MEASUREMENTS ARE IN INCHES

	22 inch Boilers	28 inch Boilers	40 inch Boilers	60 inch Boilers
A	35	41	55	82
B	39¼	45¼	59¼	86¼
C	52	62¾	72½	74¼
D	59	70½	80	81½
E	47¾	59	70	72¾
F	42¾	53	61¾	63½
J	12¾	15	15	15
K	29½	36	48¼	69
L	14 x 10	18 x 10	24 x 13	24 x 13 (2)
M	41	51	58	60
N	16	19	19¼	20
O	13	16	18	18
P	13	16	21	26
R	25½	27¼	43	**64
S	6½	7½	7¾	8

Dimension "L" is size of fire door.

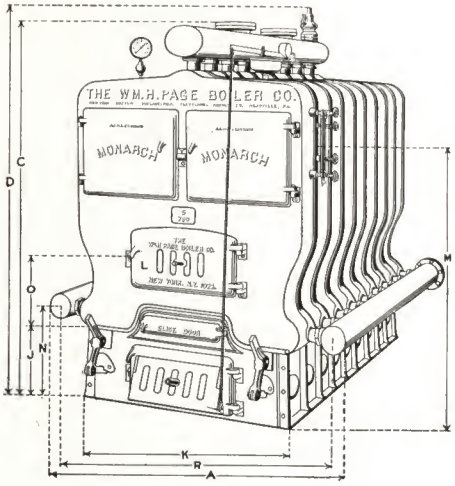
Dimension "R" is distance between returns.

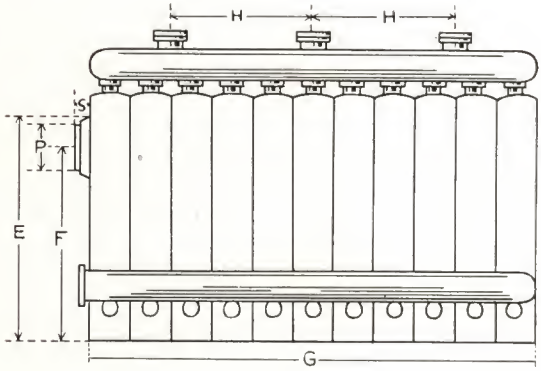
**Three inlets are provided for 60" boilers, two of them in left hand half of rear section, 26⅜" center to center.

For distance between outlets, see Arrangement of Sections, pages 60, 61, and 62 allowing 6⅜" center to center per section on 22 inch boilers, 8⅜" center to center per section on 28 inch, 40 inch, and 60 inch boilers.

MONARCH WATER TUBE BOILERS

HEADER TYPE





MONARCH HEADER BOILER DIMENSIONS

REGULAR AND SMOKELESS TYPES

MEASUREMENTS ARE IN INCHES

	22 inch Boilers	28 inch Boilers	40 inch Boilers
A	44	62	75
C	61	74	82
D	65½	81½	88
E	47¾	59	70
F	42¾	53	61¾
H	See Note †		
J	12¾	15	15
K	29½	36	48¼
L	14 x 10	18 x 10	24 x 13
M	41	51	58
N	16	19	19¼
O	13	16	18
P	13	16	21
R	38½	52¾	65½
S	6½	7½	7¾

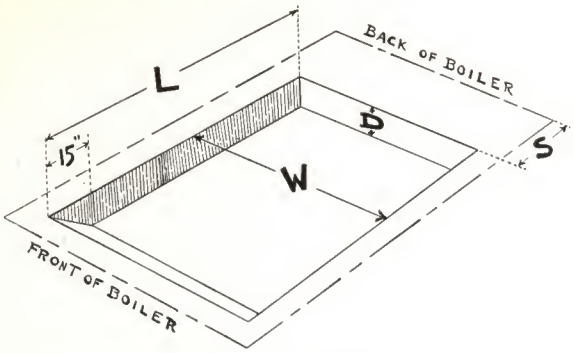
Dimension "L" is size of fire door.

†Center to center of outlets:

4-22	10½ in.	8-28	38¾ in.	9-40	38¾ in.	
5-22	17 in.	9-28	38¾ in.	10-40	41¾ in.	
6-22	20 in.	10-28	41¾ in.	*11-40	22½ in.	
7-22	22 in.	*11-28	22½ in.	*12-40	22½ in.	
8-22	22 in.	*12-28	22½ in.	*13-40	22½ in.	
4-28	14¾ in.	5-40	18¾ in.	*14-40	31 5/16 in.	
5-28	18¾ in.	6-40	20¾ in.	*15-40	31 5/16 in.	
6-28	20¾ in.	7-40	30¾ in.	*16-40	31 5/16 in.	
7-28	30¾ in.	8-40	38¾ in.			

*Three outlets.

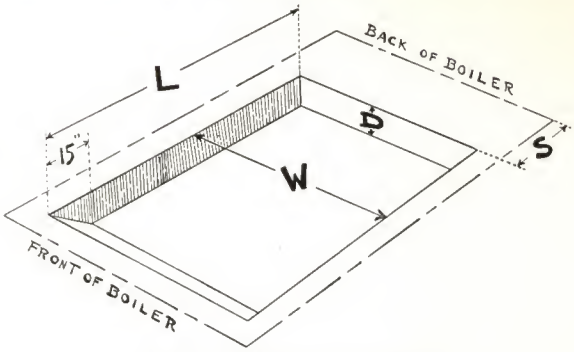
MONARCH WATER TUBE BOILERS



ASHPIT DIMENSIONS (in inches)

Number of Boiler (Steam or Water)	L	W	D	S
4-22	20	21	12	3
5-22	26	21	12	3
6-22	32	21	12	3
7-22	39	21	12	3
8-22	45	21	12	3
4-28	24	27	12	5
5-28	33	27	12	5
6-28	41	27	12	5
7-28	49	27	12	5
8-28	58	27	12	5
9-28	66	27	12	5
10-28	66	27	12	13
11-28	66	27	12	21
12-28	66	27	12	29
5-40	33	38	18	5
6-40	41	38	18	5
7-40	49	38	18	5
8-40	58	38	18	5
9-40	66	38	18	5
10-40	75	38	18	5
11-40	83	38	18	5
12-40	91	38	18	5
13-40	91	38	18	13
14-40	91	38	18	21
15-40	91	38	18	29
16-40	91	38	18	37
6-60	41	58	18	5
7-60	49	58	18	5
8-60	58	58	18	5
9-60	66	58	18	5
10-60	66	58	18	13
11-60	66	58	18	21
12-60	75	58	18	21
13-60	75	58	18	29
14-60	75	58	18	37
15-60	83	58	18	37
16-60	83	58	18	46
17-60	83	58	18	55
18-60	91	58	18	55
19-60	91	58	18	63
20-60	91	58	18	71

MONARCH SMOKELESS BOILERS



ASHPIT DIMENSIONS (in inches)

Number of Boiler (Steam or Water)	L	W	D	S
22-5	26	21	12	3
22-6	32	21	12	3
22-7	39	21	12	3
22-8	45	21	12	3
28-5	33	27	12	5
28-6	41	27	12	5
28-7	49	27	12	5
28-8	49	27	12	13
28-9	58	27	12	13
28-10	58	27	12	21
28-11	66	27	12	21
28-12	66	27	12	29
40-5	33	38	18	5
40-6	41	38	18	5
40-7	49	38	18	5
40-8	58	38	18	5
40-9	58	38	18	13
40-10	66	38	18	13
40-11	66	38	18	21
40-12	66	38	18	29
40-13	75	38	18	29
40-14	75	38	18	37
40-15	83	38	18	37
40-16	83	38	18	46
40-17	91	38	18	46
40-18	91	38	18	55
40-19	91	38	18	63
40-20	91	38	18	71
60-7	49	58	18	5
60-8	58	58	18	5
60-9	66	58	18	5
60-10	66	58	18	13
60-11	66	58	18	21
60-12	75	58	18	21
60-13	75	58	18	29
60-14	75	58	18	37
60-15	83	58	18	37
60-16	83	58	18	46
60-17	83	58	18	55
60-18	91	58	18	55
60-19	91	58	18	63
60-20	91	58	18	71

MONARCH WATER TUBE BOILERS

ARRANGEMENT OF SECTIONS

F—Front Section
I—Blank Intermediate Section
*O—Outlet Intermediate Section
W—Blank Bridgewall Section
W†—Rear Flue Bridgewall Section
R—Blank Rear Flue Section
B—Back Section

22″ BOILERS

4-22—F-O-O-B
5-22—F-O-I-O-B
6-22—F-O-I-I-O-B
7-22—F-O-I-I-I-O-B
8-22—F-O-I-I-I-I-O-B

28″ BOILERS

4-28—F-O-O-B
5-28—F-O-I-O-B
6-28—F-O-I-I-O-B
7-28—F-O-I-I-I-O-B
8-28—F-O-I-I-I-O-I-B
9-28—F-O-I-I-I-I-O-R-B
10-28—F-O-I-I-I-I-O-I-W†-B
11-28—F-O-I-I-I-I-I-O-W-R-B
12-28—F-O-I-I-I-I-I-O-W-I-R-B

40″ BOILERS

5-40—F-O-I-O-B
6-40—F-O-I-I-O-B
7-40—F-O-I-I-O-I-B
8-40—F-I-O-I-I-O-I-B
9-40—F-I-O-I-I-O-I-R-B
10-40—F-I-O-I-I-I-O-I-R-B
11-40—F-I-O-I-I-O-I-I-O-R-B
12-40—F-I-O-I-I-O-I-I-O-I-R-B
13-40—F-I-O-I-I-I-O-I-I-I-O-W†-B
14-40—F-I-O-I-I-I-O-I-I-I-O-W-R-B
15-40—F-I-O-I-I-I-I-O-I-I-I-W-O-R-B
16-40—F-I-O-I-I-I-I-O-I-I-I-W-O-I-R-B

*Outlet refers to section with Supply Tapping.

MONARCH WATER TUBE BOILERS

ARRANGEMENT OF SECTIONS

F—Front Section
I—Blank Intermediate Section
*O—Outlet Intermediate Section
X—Blank Air Inductor Section
*A—Outlet Air Inductor Section
R—Blank Rear Flue Section
W†—Rear Flue Bridgewall Section
O†—Outlet Rear Flue Section
W—Blank Bridgewall Section
B—Back Section

60″ BOILERS

6-60—F-O-I-I-O-B
7-60—F-O-I-I-O-I-B
8-60—F-I-O-I-I-O-I-B
9-60—F-O-I-I-O-I-I-O†-B
10-60—F-O-I-I-O-I-I-O-W†-B
11-60—F-O-I-I-O-I-I-O-W-R-B
12-60—F-O-I-I-O-I-I-O-I-W-R-B
13-60—F-I-O-I-I-O-I-I-O-W-I-R-B
14-60—F-I-O-I-I-I-O-I-I-W-O-I-R-B
15-60—F-I-O-I-I-I-I-O-I-I-W-I-O-R-B
16-60—F-I-O-I-I-I-I-O-I-I-W-I-O-I-R-B
17-60—F-I-O-I-I-I-I-O-I-I-W-I-O-I-I-R-B
18-60—F-I-O-I-I-I-I-O-I-I-I-W-O-I-I-I-R-B
19-60—F-I-O-I-I-I-I-I-O-I-I-W-I-I-O-I-I-R-B
20-60—F-I-O-I-I-I-I-I-O-I-I-W-I-I-O-I-I-I-R-B

MONARCH SMOKELESS BOILERS

22″ BOILERS

22- 5—F-O-X-A-B
22- 6—F-O-I-X-A-B
22- 7—F-O-I-I-X-A-B
22- 8—F-O-I-I-I-X-A-B

28″ BOILERS

28- 5—F-O-X-A-B
28- 6—F-O-I-X-A-B
28- 7—F-O-I-I-X-A-B
28- 8—F-O-I-I-X-A-W-B
28- 9—F-O-I-I-I-X-A-W†-B
28-10—F-O-I-I-I-X-A-W-R-B
28-11—F-O-I-I-I-I-X-A-W-R-B
28-12—F-O-I-I-I-I-X-A-W-I-R-B

For arrangement of sections of 40″ and 60″ Monarch Smokeless Boilers, see page 62.

*Outlet refers to section with supply Tapping.

MONARCH SMOKELESS BOILERS

ARRANGEMENT OF SECTIONS

F—Front Section
I—Blank Intermediate Section
*O—Outlet Intermediate Section
X—Blank Air Inductor Section
*A—Outlet Air Inductor Section
R—Blank Rear Flue Section
W†—Rear Flue Bridgewall Section
W—Blank Bridgewall Section
*T—Outlet Bridgewall Section
B—Back Section

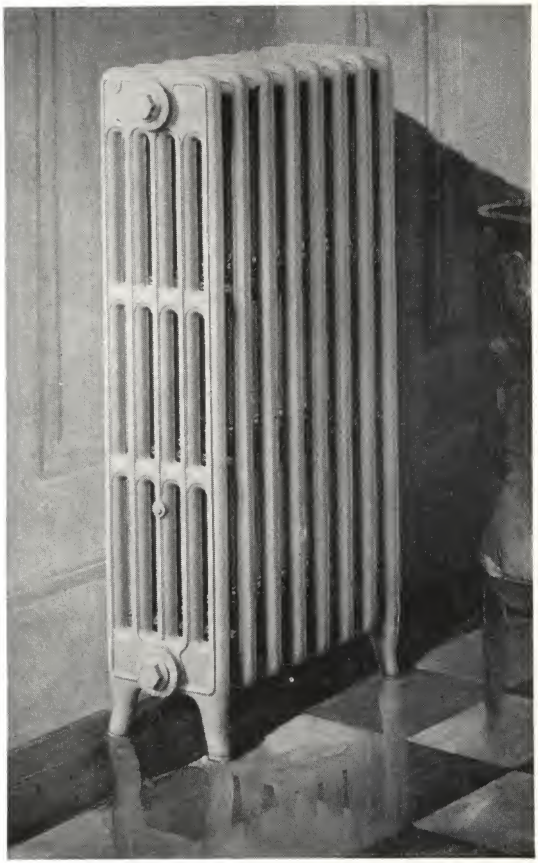
40″ BOILERS

40- 5—F-O-X-A-B
40- 6—F-O-I-X-A-B
40- 7—F-O-I-I-A-X-B
40- 8—F-I-O-I-I-A-X-B
40- 9—F-I-O-I-I-A-X-W†-B
40-10—F-I-O-I-I-I-A-X-W†-B
40-11—F-I-O-I-I-O-X-X-T-R-B
40-12—F-I-O-I-I-O-X-X-T-I-R-B
40-13—F-I-O-I-I-I-O-X-X-W-O-R-B
40-14—F-I-O-I-I-I-O-X-X-W-O-I-R-B
40-15—F-I-O-I-I-I-I-O-X-X-W-I-O-R-B
40-16—F-I-O-I-I-I-I-O-X-X-W-I-O-I-R-B
40-17—F-I-O-I-I-I-I-O-I-X-X-W-O-I-I-R-B
40-18—F-I-O-I-I-I-I-O-I-X-X-W-O-I-I-I-R-B
40-19—F-I-O-I-I-I-I-I-O-X-X-W-I-I-O-I-I-R-B
40-20—F-I-O-I-I-I-I-I-O-X-X-W-I-I-O-I-I-I-R-B

60″ BOILERS

60- 7—F-O-I-I-X-A-B
60- 8—F-O-I-I-I-A-X-B
60- 9—F-O-I-I-O-I-X-A-B
60-10—F-O-I-I-O-I-X-A-W†-B
60-11—F-O-I-I-O-I-X-A-W-R-B
60-12—F-O-I-I-O-I-I-A-X-W-R-B
60-13—F-I-O-I-I-O-I-X-A-W-I-R-B
60-14—F-I-O-I-I-I-O-X-X-W-O-I-R-B
60-15—F-I-O-I-I-I-I-O-X-X-W-I-O-R-B
60-16—F-I-O-I-I-I-I-O-X-X-W-I-O-I-R-B
60-17—F-I-O-I-I-I-I-O-X-X-W-I-O-I-I-R-B
60-18—F-I-O-I-I-I-I-O-I-X-X-W-O-I-I-I-R-B
60-19—F-I-O-I-I-I-I-I-O-X-X-W-I-I-O-I-I-R-B
60-20—F-I-O-I-I-I-I-I-O-X-X-W-I-I-O-I-I-I-R-B

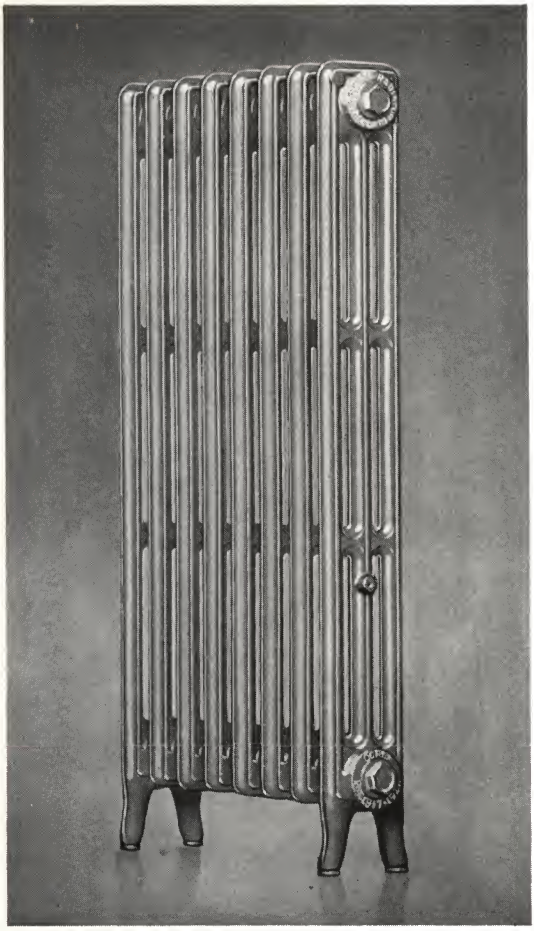
*Outlet refers to section with Supply Tapping.



THE RADIATOR CLASSIC

RADIATORS

THREE TUBE



RADIATORS

THREE TUBE

Number of Sections	* Length, 2½ In. per Section	20-Inch Height, 1¾ Sq. Ft. per Section	26-Inch Height, 2⅓ Sq. Ft. per Section	32-Inch Height, 3 Sq. Ft. per Section	38-Inch Height, 3½ Sq. Ft. per Section
2	5	3½	4⅔	6	7
3	7½	5¼	7	9	10½
4	10	7	9⅓	12	14
5	12½	8¾	11⅔	15	17½
6	15	10½	14	18	21
7	17½	12¼	16⅓	21	24½
8	20	14	18⅔	24	28
9	22½	15¾	21	27	31½
10	25	17½	23⅓	30	35
11	27½	19¼	25⅔	3	38½
12	30	21	28	,,	42
13	32½	22¾	30⅓	39	45½
14	35	24½	32⅔	42	49
15	37½	26¼	35	45	52½
16	40	28	37⅓	48	56
17	42½	29¾	39⅔	51	59½
18	45	31½	42	54	63
19	47½	33¼	44⅓	57	66½
20	50	35	46⅔	60	70
21	52½	36¾	49	63	73½
22	55	38½	51⅓	66	77
23	57½	40¼	53⅔	69	80½
24	60	42	56	72	84
25	62½	43¾	58⅓	75	87½
26	65	45½	60⅔	78	91
27	67½	47¼	63	81	94½
28	70	49	65⅓	84	98
29	72½	50¾	67⅔	87	101½
30	75	52½	70	90	105

TAPPINGS—1½" top and bottom. Bushed for steam or water as per specifications.

CONNECTIONS—Both steam and water—extra heavy 1½" right and left threaded nipples at top and bottom.

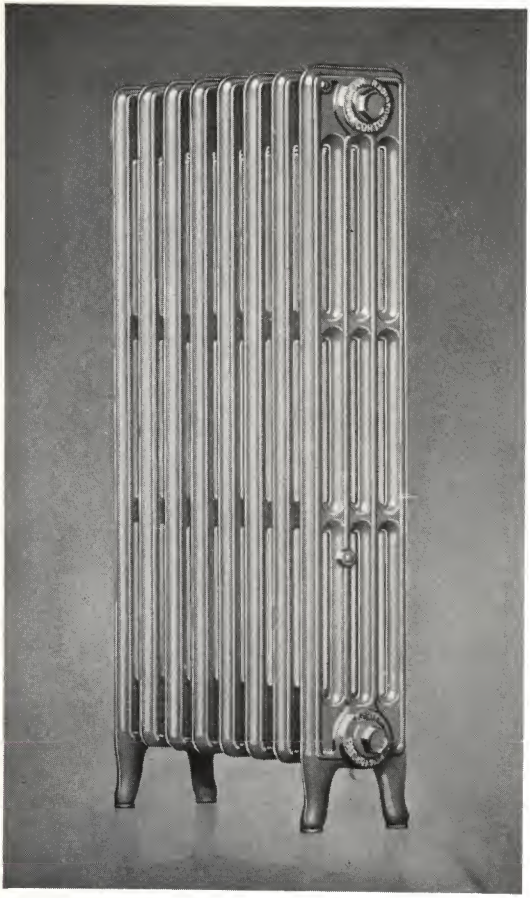
*Add ½" to length for each bushing.

Centers, 2½ inches.

Width, 4⅝ inches.

RADIATORS

FOUR TUBE



RADIATORS

FOUR TUBE

Number of Sections	* Length, 2½ In. per Section	20-Inch Height, 2¼ Sq. Ft. per Section	26-Inch Height, 2¾ Sq. Ft. per Section	32-Inch Height, 3½ Sq. Ft. per Section	38-Inch Height, 4¼ Sq. Ft. per Section
2	5	4½	5½	7	8½
3	7½	6¾	8¼	10½	12¾
4	10	9	11	14	17
5	12½	11¼	13¾	17½	21¼
6	15	13½	16½	21	25½
7	17½	15¾	19¼	24½	29¾
8	20	18	22	28	34
9	22½	20¼	24¾	31½	38¼
10	25	22½	27½	35	42½
11	27½	24¾	30¼	38½	46¾
12	30	27	33	42	51
13	32½	29¼	35¾	45½	55¼
14	35	31½	38½	49	59½
15	37½	33¾	41¼	52½	63¾
16	40	36	44	56	68
17	42½	38¼	46¾	59½	72¼
18	45	40½	49½	63	76½
19	47½	42¾	52¼	66½	80¾
20	50	45	55	70	85
21	52½	47¼	57¾	73½	89¼
22	55	49½	60½	77	93½
23	57½	51¾	63¼	80½	97¾
24	60	54	66	84	102
25	62½	56¼	68¾	87½	106¼
26	65	58½	71½	91	110½
27	67½	60¾	74¼	94½	114¾
28	70	63	77	98	119
29	72½	65¼	79¾	101½	123¼
30	75	67½	82½	105	127½

TAPPINGS—1½" top and bottom. Bushed for steam or water as per specifications.

CONNECTIONS—Both steam and water—extra heavy 1½" right and left threaded nipples at top and bottom.

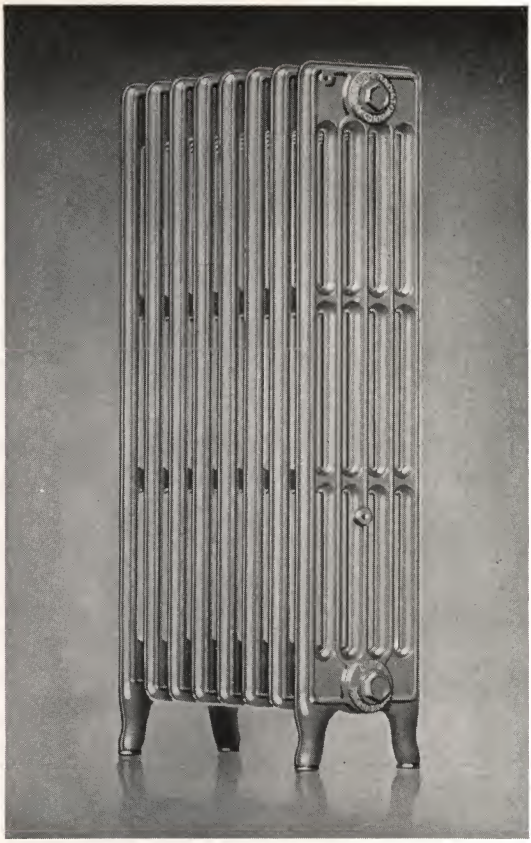
*Add ½" to length for each bushing.

Centers, 2¼ inches.

Width, 6 5/16 inches.

RADIATORS

FIVE TUBE



RADIATORS

FIVE TUBE

Number of Sections	* Length, 2½ In. per Section	20-Inch Height, 2⅔ Sq. Ft. per Section	26-Inch Height, 3¼ Sq. Ft. per Section	32-Inch Height, 4⅓ Sq. Ft. per Section	38-Inch Height, 5 Sq. Ft. per Section
2	5	5⅓	7	8⅔	10
3	7½	8	10½	13	15
4	10	10⅔	14	17⅓	20
5	12½	13⅓	17½	21⅔	25
6	15	16	21	26	30
7	17½	18⅔	24½	30⅓	35
8	20	21⅓	28	34⅔	40
9	22½	24	31½	39	45
10	25	26⅔	35	43⅓	50
11	27½	29⅓	38½	47⅔	55
12	30	32	42	52	60
13	32½	34⅔	45½	56⅓	65
14	35	37⅓	49	60⅔	70
15	37½	40	52½	65	75
16	40	42⅔	56	69⅓	80
17	42½	45⅓	59½	73⅔	85
18	45	48	63	78	90
19	47½	50⅔	66½	82⅓	95
20	50	53⅓	70	86⅔	100
21	52½	56	73½	91	105
22	55	58⅔	77	95⅓	110
23	57½	61⅓	80½	99⅔	115
24	60	64	84	104	120
25	62½	66⅔	87½	108⅓	125
26	65	69⅓	91	112⅔	130
27	67½	72	94½	117	135
28	70	74⅔	98	121⅓	140
29	72½	77⅓	101½	125⅔	145
30	75	80	105	130	150

TAPPINGS—1½" top and bottom. Bushed for steam or water as per specifications.

CONNECTIONS—Both steam and water—extra heavy 1½" right and left threaded nipples at top and bottom.

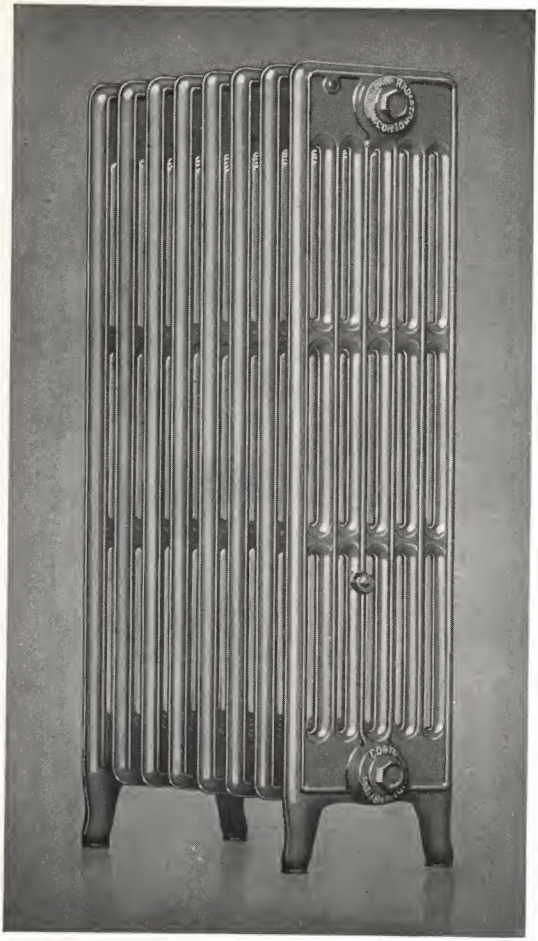
*Add ½" to length for each bushing.

Centers, 2½ inches.

Width, 8 inches.

RADIATORS

SIX TUBE



RADIATORS

SIX TUBE

Number of Sections	* Length 2½ In. per Section	20-Inch Height, 3 Sq. Ft. per Section	26-Inch Height, 4 Sq. Ft. per Section	32-Inch Height, 5 Sq. Ft. per Section	38-Inch Height, 6 Sq. Ft. per Section
2	5	6	8	10	12
3	7½	9	12	15	18
4	10	12	16	20	24
5	12½	15	20	25	30
6	15	18	24	30	36
7	17½	21	28	35	42
8	20	24	32	40	48
9	22½	27	36	45	54
10	25	30	40	50	60
11	27½	33	44	55	66
12	30	36	48	60	72
13	32½	39	52	65	78
14	35	42	56	70	84
15	37½	45	60	75	90
16	40	48	64	80	96
17	42½	51	68	85	102
18	45	54	72	90	108
19	47½	57	76	95	114
20	50	60	80	100	120
21	52½	63	84	105	126
22	55	66	88	110	132
23	57½	69	92	115	138
24	60	72	96	120	144
25	62½	75	100	125	150
26	65	78	104	130	156
27	67½	81	108	135	162
28	70	84	112	140	168
29	72½	87	116	145	174
30	75	90	120	150	180

TAPPINGS—1½" top and bottom. Bushed for steam or water as per specifications.

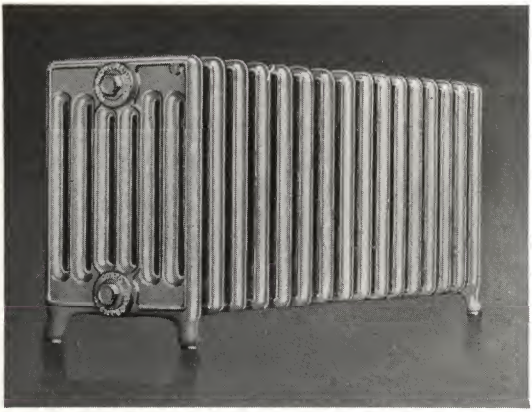
CONNECTIONS—Both steam and water—extra heavy 1½" right and left threaded nipples at top and bottom.

*Add ½" to length for each bushing.

Centers, 2½ inches.

Width, 9 11/16 inches.

WINDOW RADIATORS



WINDOW RADIATORS

Number of Sections	*Length 2½ In. per Section	14-Inch Height, 2½ Sq. Ft. per Section	17-Inch Height, 3 Sq. Ft. per Section	20-Inch Height, 3⅔ Sq. Ft. per Section
2	5	5	6	7⅓
3	7½	7½	9	11
4	10	10	12	14⅔
5	12½	12½	15	18⅓
6	15	15	18	22
7	17½	17½	21	25⅔
8	20	20	24	29⅓
9	22½	22½	27	33
10	25	25	30	36⅔
11	27½	27½	33	40⅓
12	30	30	36	44
13	32½	32½	39	47⅔
14	35	35	42	51⅓
15	37½	37½	45	55
16	40	40	48	58⅔
17	42½	42½	51	62⅓
18	45	45	54	66
19	47½	47½	57	69⅔
20	50	50	60	73⅓
21	52½	52½	63	77
22	55	55	66	80⅔
23	57½	57½	69	84⅓
24	60	60	72	88
25	62½	62½	75	91⅔
26	65	65	78	95⅓
27	67½	67½	81	99
28	70	70	84	102⅔
29	72½	72½	87	106⅓
30	75	75	90	110

TAPPINGS—1½" top and bottom. Bushed for steam or water as per specifications.

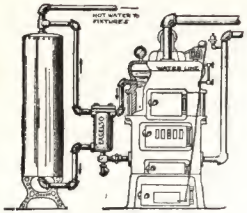
CONNECTIONS—Both steam and water—extra heavy 1½" right and left threaded nipples at top and bottom.

*Add ½" to length for each bushing.

Centers, 2½ inches.

Width, 11⅜ inches.

EXCELSO WATER HEATERS

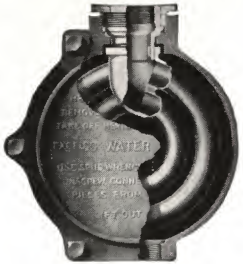


Boiler, Heater and Tank

DIMENSIONS — PRICE LIST — CAPACITIES

Size of Heater	Jr.	11	12	13	14	15	25	26	27	28	35	36	37
Length, in.	8½	10½	14	11½	15	19½	12½	15	19	23¼	21	25	29
Diameter, in.	5	5	5	6½	6½	6½	9	9	9	9	13¾	13¾	13¾
Shell openings, in.	1	1	1	1½	1½	1½	2	2	2	2	3	3	3
Coil openings, in.	¾	¾	¾	1	1	1	1½	1½	1½	1½	2½	2½	2½
Weight, c'rt'd, lbs.	11	17	23	31	39	46	58	68	82	95	185	210	240
List Price	$12.50	$30	$40	$50	$60	$70	$120	$150	$180	$210	$310	$400	$490

HEATING WATER BELOW WATER LINE OF STEAM OR VAPOR BOILERS



Double Coil Heater

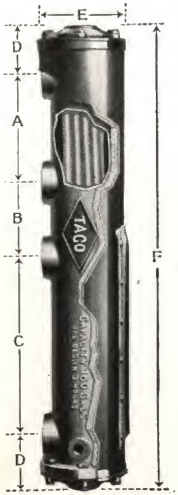
Size	Jr.	11	12	13	14	15	25	26	27	28	35	36	37
Gals. Tank Capacity	30	30 32 40	42 52	60 66	82 90 100	120 144	160	180 220	250 300	372 420	600	800	1000

Temperature rise 100° in 3 hours.

HEATING WATER WITH LIVE STEAM

Size of Heater	Jr.	11	12	13	14	15	25	26	27	28	35	36	37
Tank Capacity	45	50	75	100	150	200	250	300	450	600	900	1200	1500

Temperature rise 100° in 3 hours at 5 lb. pressure.



Size	DOMESTIC TACO HEATERS *With Brass Unions* 0	30	1	2	3	TACO NO. 4, 5, 6 4	5	6
Capacity, below water line, gal.								
100° rise 3 hours	30	30–40	40–60	80–120	160–200	.....	.....	.....
★100° rise 1 hour	.....	.....	.....	30–40	50–66	.....	.....	.....
Capacity, below water line, gal.	.....	.....	.....	.....	.....	*	*	*
100° rise 3 hrs. cap., steam	.....	.....	.....	.....	.....	600	1200	1800
★100° rise 1 hour, " "	.....	.....	.....	.....	.....	200	400	600
Square feet water radiation	.....	.....	.....	60	120	240	480	750
Height, inches	8½	11	13	16½	21½	26**	38**	40**
Diameter, inches	5½	5½	5½	7½	8½	8	11¾	13½
Tank connections, inches	¾	¾	¾	1	1¼	2	2½	3
Boiler connections, inches	1	1	1	1¼	2	2	2½	3
Shipping weight, pounds	9	11	14	24	54	96	192	265
LIST PRICES	$10.00	$15.00	$20.00	$30.00	$50.00	$100.00	$200.00	$300.00

When desired below water line, Capacity Gallons.
100° rise 3 hrs. No. 4, 320; No. 5, 640; No. 6, 960
★100° rise 1 hr. No. 4, 100; No. 5, 210; No. 6, 320

*For these capacities Super Tacos are recommended.
**Length.

JACKETED SUPER TACO HEATERS

Size	7	8	9	10	12	15	20	25	35	50	75	100
Capacity, gals												
100° rise 3 hours	160	220	320	450	600	800	1000	1250	1750	2500	3750	5000
★100° rise 1 hour	52	70	100	150	200	265	333	415	580	830	1250	1660
A	8	10	8	10	10	12	7½	8½	8½	12	12	12
B	5½	7½	5	7	6½	9	8	11½	11½	18	18	18
C	13½	17½	13	17	16½	21	15½	20	20	30	30	29
D	3¾	3¾	5	5	6	6	7	7	7½	8½	10½	12½
E	6¼	6¼	7½	7½	9¼	9¼	11¾	11¾	14¼	14¼	19	21
F	34½	42½	36	44	45	54	45	54	55	77	81	84
Boiler con's., in.	2	2	2½	2½	3	3	4	4	4	5	5	6
Tank con's., in.	1½	1½	2	2	2	2	2½	2½	4	4	5	6
Shipping wt., lbs.	70	100	130	150	185	220	280	350	500	685	1050	1250
LIST PRICE	$55	$70	$90	$110	$150	$190	$270	$330	$470	$670	$1000	$1300

Increase size of Taco for inadequate tank capacity. Thirty-gallon tank capacity is usually required per family.
★For intermittent oil or gas fired installations, capacities based on 100° temperature rise in 1 hour are recommended.

AUTOMATIC AIR VALVES

VOLUNTEER AUTOMATIC AIR VALVES

The expanding material used in our Volunteer Automatic Air Valves has been thoroughly tested. It does not deteriorate from use or age, and is fully warranted for five years. The frictionless corrugated float is used exclusively. This float cannot stick, and insures positive action. The expanding post of the valve is reinforced by an inner brass tube, which holds the post absolutely straight, thus securing a perfect seat and preventing any possible injury to the valve.

MARVAL AUTOMATIC AIR VALVES

The Marval Syphon Automatic Air Valve is a popular priced, efficient and thoroughly dependable all-metal factory adjusted valve.

Valve is entirely automatic in action and sealed against tampering.

Vents all air—at all temperatures.

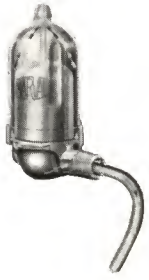
Closes by thermostatic action for steam.

The free and independent buoyant float closes the Valve promptly for water.

Is a self-draining Valve and cannot "waterlog."

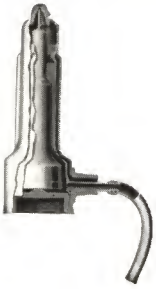
Closes for steam, shuts off for water, but vents all air from the radiator.

The volatile fluids in the thermostatic diaphragm are so balanced to permit air at all temperatures to escape from the radiator but to close the Valve instantly for steam.



AUTOMATIC AIR VALVES

HOFFMAN No. 1 AIR VALVES



The Hoffman No. 1 Valve consists of an Outer Shell and Base, an Inner Shell, a Float, Valve Pin, Vent Port and Siphon.

The Float, which is likewise the thermostatic member, is a sealed chamber containing a heat-sensitive fluid and has a flexible diaphragm bottom. There is always a wide open venting port through which air escapes until steam comes in contact with the float, when its action is so positive that the expanding diaphragm instantly closes the venting port. There is no premature closing with the resultant loss in radiator heat efficiency.

The sensitiveness of this Valve in distinguishing between steam and heated air assures maximum heat with minimum fuel consumption. Its action under water conditions is equally positive and prevents any possibility of water leaking or spitting.

HOFFMAN No. 2 AIR VALVES

The Hoffman No. 2 Air and Vacuum Valve installed on an ordinary one-pipe steam system changes it into a one-pipe Vacuum type.

In operation the No. 2 Valve functions under steam and water conditions exactly the same as the No. 1 Valve, but, in addition, after air is once vented from the system, through the instantaneous and automatic closing of this port, the intake of air is prevented.

RADIATOR VALVES

STEAM RADIATOR VALVES
WITH UNION

These valves have packing gland in stuffing box; are made of the best material, heavy and well finished, and full opening.

PRICE LIST

TYPE	½″	¾″	1″	1¼″	1½″	2″
Angle Valves	$3.70	$4.30	$5.10	$6.40	$8.40	$13.60
Globe Valves	3.70	4.30	5.10	6.40	8.40	13.60
R. H. Corner Valves	.....	4.75	5.60	7.05	9.25	15.00
L. H. Corner Valves	.....	4.75	5.60	7.05	9.25	15.00

All valves rough body, nickel-plated all over.

QUICK OPENING HOT WATER RADIATOR VALVES
WITH UNION

These valves have packing gland in stuffing box.

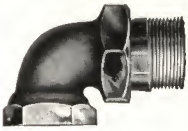
PRICE LIST

TYPE	½″	¾″	1″	1¼″	1½″	2″
Angle Valves	$3.25	$3.70	$4.50	$5.75	$7.30	$12.00
Straightway Valves	.....	3.70	4.50	5.75	7.30	.....

All valves rough body, nickel-plated all over.

UNION ELBOWS AND THERMOMETERS

UNION ELBOWS



PRICE LIST

Size	½″	¾″	1″	1¼″	1½″	2″
Rough Body, nickel-plated all over.....	$1.75	$2.00	$2.50	$3.30	$4.25	$7.20

HOT WATER THERMOMETER

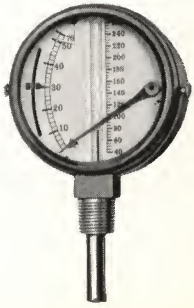
Accurately indicates the temperature of the water in a hot water heating apparatus.

It is unsurpassed for accuracy, sensitiveness, durability and practical construction.

Each thermometer guaranteed, and carefully packed and boxed.

COMBINATION THERMOMETER AND ALTITUDE GAUGE

The combination hot water thermometer and altitude gauge, shown at right, indicates the height of the water in the system, as well as the operating temperature.



STEAM AND ALTITUDE GAUGES

STEAM GAUGES

WITH BOURDON SPRING

Size 3½ and 4½ inches, iron case, silvered dial; without cock. Registering 30 lbs. pressure.

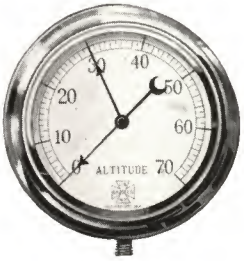
In all respects as regularly supplied on our Steam Boilers.

These gauges are all equipped with hairspring tension, so the movement is rendered very sensitive at the lowest pressures under which house-heating boilers are usually operated—viz., 2 lbs. or less. We can also supply high-pressure gauges.

ALTITUDE GAUGES

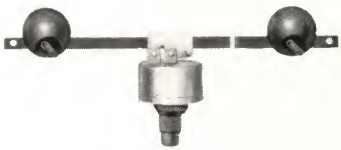
These gauges will indicate accurately, at the boiler, the height of water in the system, and will be found very useful instruments.

EXPLANATION: When the water is at its proper level in expansion tank, remove the ring and glass, and set the stationary hand at the pressure indicated by the working hand; whenever the pressure falls below this point, water should be added. Size 4½ inches; iron case with brass rim; no cock.



PAGE METALLIC SYLPHON REGULATOR

FOR DAMPER CONTROL OF HOT WATER BOILERS AND HOT WATER SUPPLY BOILERS



Damper regulation of Hot Water Boilers (for heating) is as essential for economical operation and comfort as is the regulation of Steam Boilers, and in installations of Hot Water Supply Boilers is of vital importance.

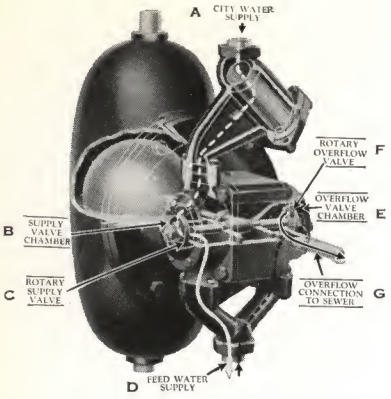
Highly sensitive and accurate, the Page Metallic Sylphon Regulator responds to the slightest change in the temperature of the water, and controls the drafts so as to maintain constantly any degree between 100 and 220 degrees Fahrenheit. Changing the position of the weights on the lever obtains proper temperature adjustment. Lever also is adjustable longitudinally.

The construction is strong and durable—a heavy cast housing, within which is a one-piece, seamless, solderless, flexible metal bellows, and thermostatic bulb. With rising temperature, vaporizing of the volatile liquid within the bulb exerts a pressure within the bellows, thrusting the plunger upward, tilting the lever and closing the draft.

Easily and quickly installed on old or new systems, in water dome of boiler or in flow pipe.

DUPLEX BOILER FEEDER

DEPENDABLE BOILER PROTECTION



The McDonnell & Miller Self-Cleaning Duplex Boiler Feeder automatically maintains the correct water level in steam, vapor or vacuum heating boilers, regardless of how hard the boiler is being pushed, and even in the event that the condensation pump stops. Its action is entirely independent of operating skill and attention.

By keeping the boiler water line where it belongs the McDonnell & Miller Duplex Feeder is a positive, mechanical protection against burned boilers or cracked sections.

HOW IT OPERATES

City water enters feeder at (A), passes through large strainer and then to supply valve chamber (B).

When boiler water line drops, causing corresponding drop in float chamber, the float, in dropping, turns the rotary valve disc, thus opening the supply valve (C), allowing city water to pass through the manifold and into the boiler feed line connected at (D).

If condensation returning to the boiler causes water line to rise abnormally, a corresponding rise occurs in feeder float chamber. The float in rising opens the rotary overflow valve (F) in overflow valve chamber (E), permitting excess water to discharge to sewer at (G).

SERVICE CONDITIONS

The Duplex Feeder is adaptable to all low pressure heating boiler conditions.

The standard type is suitable for all boilers up to and including 14,500 sq. ft., where differential pressure is 30 lbs. or above. For larger boilers, and where the differential pressure is low, the McDonnell & Miller Special Type is furnished.

Maximum allowable steam pressure is 20 lbs. Water pressure should always be at least 5 lbs. higher than steam pressure.

MINNEAPOLIS—HONEYWELL THERMOSTATS

TYPE R

The Type R 15–20 Day Thermostat is Honeywell's latest contribution to the heating industry.

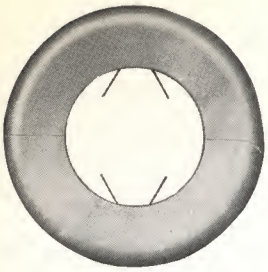
Equipped with jeweled balance clock movement, it is a dependable time-keeper, yet only about one-half the usual size.

It functions automatically, raising the temperature in the morning, lowering it to any predetermined degree at any time during the evening, and requires no attention except periodical winding. It is wound from the front.

Any desired temperature setting can be had during the day by turning the knob under the clock. A feature of importance is the day and night indicator, showing at a glance whether the clock is on the day or night period.

Electric motor, spring motor or gravity motor may be had in combination with the Type R or the Type 6 one day Thermostat. Combinations include all wire, chain, pulley, and brackets necessary for installation.

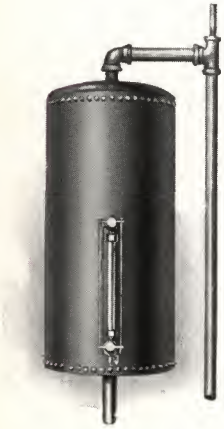
FLOOR AND CEILING PLATES



Beaton Plates are made of pressed steel, nickel-plated or of black finish, and can be easily put on the pipe after the work is finished by slipping the plate around the pipe. Plates are held firmly in place by a steel spring.

Size	½″	¾″	1″	1¼″	1½″	2″	2½″	3″	3½″	4″
Nickel-plated, each	.27	.28	.32	.35	.38	.45	.65	.80	1.00	1.25

GALVANIZED EXPANSION TANKS



Our Tanks are made of refined galvanized steel, tested to one hundred pounds pressure. They have double riveted longitudinal seams and reinforced one inch outlets at top and bottom.

Capacity Gallons	Size Inches	Price of Tank	Price of Gauge	Square Foot Radiation
10	12 x 20	$8.00	$1.50	400
15	12 x 30	9.00	1.50	800
20	14 x 30	12.50	1.50	1200
26	16 x 30	14.00	1.50	1800
32	16 x 36	15.00	1.75	2300
42	16 x 48	16.50	1.75	3000

BLACK STEEL STANDARD STORAGE TANKS

RIVETED

Size	Gallons	Weight	Price
20 x 60	82	310	$47.00
24 x 48	94	330	55.00
24 x 60	117	380	61.00
24 x 72	141	440	66.00
24 x 84	164	490	72.00
24 x 96	188	540	77.00
30 x 48	147	430	67.00
30 x 60	184	500	74.00
30 x 72	221	560	80.00
30 x 84	258	630	87.00
30 x 96	294	700	94.00
30 x 108	335	770	100.00
30 x 120	372	840	107.00
36 x 60	265	620	91.00
36 x 72	318	700	95.00
36 x 84	371	780	99.00
36 x 96	424	870	108.00
36 x 108	477	960	116.00
36 x 120	530	1030	123.00
42 x 72	432	890	105.00
42 x 84	504	980	110.00
42 x 96	572	1070	127.00
42 x 108	644	1160	132.00
42 x 120	716	1250	143.00
42 x 144	860	1430	160.00
42 x 168	1000	1620	182.00

Standard suitable for working pressure not exceeding 85 lbs.

20″ and 24″ diameter Tanks have five 1½″ Tappings.

30″ and 36″ diameter Tanks have five 2″ Tappings.

42″ diameter Tanks have five 2½″ Tappings.

Extra charges for tappings to sketch 1″, $2.00; 1½″, $3.00; 2″, $4.00; 3″, $6.00, per Tapping.

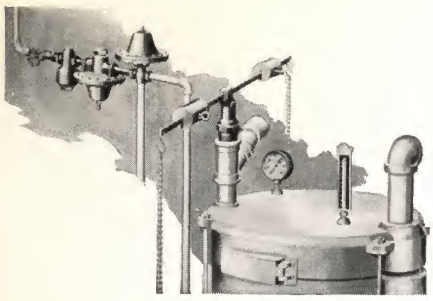
Handhole included in price. No allowance is made if Handhole is not furnished.

Extra for Manhole in head, $20.00.

Extra for Manhole in shell, $31.00.

Prices of extra heavy tanks, of galvanized tanks, and of tanks with coils, on application.

AUTOMATIC HOT WATER HEAT CONTROL SYSTEM



The Mueller Automatic System of Hot Water Heat Control is a closed system operating automatically without an expansion tank. It can be quickly installed on new or old jobs.

The water in the system is always kept fresh. This promotes good circulation. Just enough water is admitted by the reducing valve to supply the amount required as water is released by the relief valve.

The boiling point of the water is raised to a higher point than with an open system, and a very considerable saving in fuel is effected due to the automatic control of dampers, and rapid circulation. The damper regulator is a very important part of this system as it is not only a fuel saver but also is a safety feature, checking the fire when the desired temperature is reached.

Further safeguards are provided by the reducing valve and relief valve, operated by the pressure of the water in the system. These valves are especially constructed and tested for use on this system. They are positive in action and durable, the working parts being made of bronze, with phosphor bronze diaphragms.

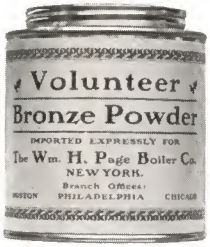
The Mueller System can be readily used with a thermostatic control, operated by a motor in the basement. Positive control of pressure in the system assures permanent safety.

BRONZE AND BRONZING LIQUID

As a result of repeated tests and experiments we have succeeded in obtaining a grade of bronze powder exactly suited for decorating steam and hot water radiators.

This bronze is our own direct importation and is of exceptional brilliancy and luster, which it retains when applied to hot surfaces, while most other kinds tarnish quickly.

A single trial will convince you of its superior quality and large covering capacity.



COLORS

*Pale Gold	Lemon
Rich Gold	Orange
Copper	Crimson
Light Green	Scarlet
Dark Green	Fire

In Pound Cans

ALUMINUM

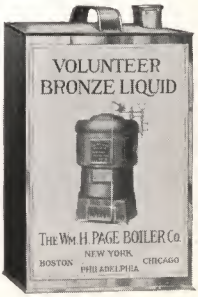
In Half Pound Cans

*Generally used.

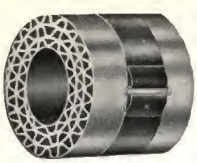
BRONZING LIQUID

Our bronzing liquid, unlike all other, emits little or no odor when applied to hot surfaces, and is of the best quality.

It is as important to use a good bronzing liquid as a good bronze. Put up in gallon and half gallon cans.



SECTIONAL PIPE INSULATION



LIST PRICES PER LINEAR FOOT

Inside Diameter of Pipe	Standard Thick	1½" Thick	2" Thick	2½" Thick	**Double Standard Thick	3" Thick Broken Joints
½"	$.22	$.46	$.75	$1.00	$.65	$1.20
¾"	.24	.49	.80	1.05	.70	1.35
1"	.27	.52	.85	1.10	.75	1.40
1¼"	.30	.56	.90	1.15	.80	1.45
1½"	.33	.60	.95	1.20	.85	1.55
2"	.36	.64	1.00	1.25	.90	1.65
2½"	.40	.70	1.05	1.35	1.00	1.75
3"	.45	.76	1.15	1.50	1.10	1.90
3½"	.50	.82	1.25	1.65	1.20	2.05
4"	.60	.88	1.35	1.80	1.40	2.20
4½"	.65	.94	1.45	1.95	1.50	2.35
5"	.70	1.00	1.55	2.10	1.60	2.50
6"	.80	1.10	1.70	2.25	1.80	2.70
7"	1.00	1.20	1.85	2.40	2.25	2.90
8"	1.10	1.35	2.00	2.55	2.50	3.15
9"	1.20	1.50	2.20	2.80	2.70	3.40
10"	1.30	1.65	2.40	3.05	2.90	3.65
*12"	1.85	1.85	2.70	3.40	4.10	4.10
14" o.d.	2.10	2.10	3.00	3.80	4.60	4.60
16" o.d.	2.35	2.35	3.30	4.20	5.10	5.10
18" o.d.	2.60	2.60	3.60	4.60	5.60	5.60
20" o.d.	2.85	2.85	4.00	5.00	6.00	6.00
24" o.d.	3.30	3.30	4.50	5.75	7.00	7.00
30" o.d.	4.00	4.00	5.50	6.95	8.40	8.40

*85% Magnesia is made in standard (approximately 1"), 1½", 2", 2½", double standard thick and 3" (broken joint) thicknesses. For pipe sizes 12" and larger it is furnished in segmental form, except that, on specific order, 12" size can be furnished sectional.

**Applies only to 85% Magnesia.

These pipe insulations are supplied in sections three feet long, canvased, and with brass lacquered bands.

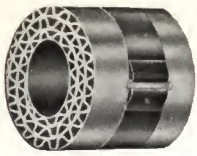
Asbestos-Sponge Felted is made in thicknesses from ½" to 3". For thicknesses 1" and under, use list prices for standard thick.

Improved Asbestocel is made in 2, 3 and 4-ply. For all thicknesses, use list prices for standard thick.

Zero is made in one thickness only, approximately 1¼". Use standard thick list prices.

Anti-Sweat is made in ½", ¾", 1", 1½" and 2" thicknesses. Use standard thick list prices for thickness 1" and under.

SECTIONAL PIPE INSULATION



LIST PRICES PER LINEAR FOOT

Inside Diameter of Pipe	Standard Thick	1½" Thick	2" Thick	2½" Thick	**Double Standard Thick	3" Thick Broken Joints
½"	$.22	$.46	$.75	$1.00	$.65	$1.20
¾"	.24	.49	.80	1.05	.70	1.35
1"	.27	.52	.85	1.10	.75	1.40
1¼"	.30	.56	.90	1.15	.80	1.45
1½"	.33	.60	.95	1.20	.85	1.55
2"	.36	.64	1.00	1.25	.90	1.65
2½"	.40	.70	1.05	1.35	1.00	1.75
3"	.45	.76	1.15	1.50	1.10	1.90
3½"	.50	.82	1.25	1.65	1.20	2.05
4"	.60	.88	1.35	1.80	1.40	2.20
4½"	.65	.94	1.45	1.95	1.50	2.35
5"	.70	1.00	1.55	2.10	1.60	2.50
6"	.80	1.10	1.70	2.25	1.80	2.70
7"	1.00	1.20	1.85	2.40	2.25	2.90
8"	1.10	1.35	2.00	2.55	2.50	3.15
9"	1.20	1.50	2.20	2.80	2.70	3.40
10"	1.30	1.65	2.40	3.05	2.90	3.65
*12"	1.85	1.85	2.70	3.40	4.10	4.10
14" o.d.	2.10	2.10	3.00	3.80	4.60	4.60
16" o.d.	2.35	2.35	3.30	4.20	5.10	5.10
18" o.d.	2.60	2.60	3.60	4.60	5.60	5.60
20" o.d.	2.85	2.85	4.00	5.00	6.00	6.00
24" o.d.	3.30	3.30	4.50	5.75	7.00	7.00
30" o.d.	4.00	4.00	5.50	6.95	8.40	8.40

*85% Magnesia is made in standard (approximately 1"), 1½", 2", 2½", double standard thick and 3" (broken joint) thicknesses. For pipe sizes 12" and larger it is furnished in segmental form, except that, on specific order, 12" size can be furnished sectional.

**Applies only to 85% Magnesia.

These pipe insulations are supplied in sections three feet long, canvased, and with brass lacquered bands.

Asbestos-Sponge Felted is made in thicknesses from ½" to 3". For thicknesses 1" and under, use list prices for standard thick.

Improved Asbestocel is made in 2, 3 and 4-ply. For all thicknesses, use list prices for standard thick.

Zero is made in one thickness only, approximately 1¼". Use standard thick list prices.

Anti-Sweat is made in ½", ¾", 1", 1½" and 2" thicknesses. Use standard thick list prices for thickness 1" and under.

BOILER OPERATION

DIRECTIONS FOR OPERATING ROUND OR SQUARE STEAM AND HOT WATER BOILERS

STEAM

Before starting the fire in a steam boiler see that the gauge glass is half full of water; also open the lower try-cock and see that it contains water. The gauge glass should always be about half full of water when the apparatus is in operation and should the water by any means get below the gauge glass the fire should be drawn and the apparatus allowed to cool down before the water is turned on. If the water is attended to at the same time as the fire, all trouble will be obviated.

To start the fire, first close the check draft in smokehood, then see that the hand damper is open.

Open the draft door in ashpit sufficiently to get a good draft. Fill the firepot full of dry kindling wood and when burning well put on sufficient coal to cover the wood. As the wood continues to burn and the coal is fully ignited, fill the firepot with coal.

The damper regulator should then be adjusted so that the draft door in the ashpit is open, the check draft at the smokehood closed, and the damper regulator lever level. The operation of the boiler can then be controlled by the weight on the lever.

In the Smokeless boiler, burning soft coal, sufficient supplemental air to insure complete combustion must be admitted and distributed over the fuel bed through the air inductor. The volume of air required varies with the rate of combustion and should be regulated by means of the doors at the sides of the boiler which are arranged to permit of increasing or diminishing the secondary air supply until the proper mixture is obtained.

The fire door should not be opened to regulate the temperature; this can be accomplished by the use of the slide in the door, check draft in the smokehood or damper in the smokepipe, with more satisfactory results and greater economy of fuel. To "keep" fire, the draft dampers must be regulated to suit the draft of chimney; no rule can be laid down in this matter, as no two chimneys draw alike; consequently each apparatus must be regulated as experience teaches and the requirements call for.

When it is desirable to check the fire and prevent the generating of steam, the chain or rod can be unhooked from the ashpit draft door or the weight removed from the damper regulator.

Occasionally pull lever of the safety valve to see that it opens easily.

Should all the water get out of the boiler, first dump the fire, open the fire door and let the boiler cool off before refilling. If the apparatus is to be left without fire in cold weather, draw off all the water to avoid freezing.

Have valves on the radiators (of one- or two-pipe steam system) either wide open or tightly closed. If partially open, the radiators will draw the water from the boiler.

HOT WATER

Before starting the fire in a hot water boiler see that the expansion tank contains water. As long as it can be seen in the gauge glass it is sufficient, but it is best to keep the glass half full of water, replenishing the supply of water in the tank as often as necessary.

To control the fire use the ashpit door and the check draft or damper in smokehood. The fire door should not be opened to regulate the temperature; this can be accomplished by the use of the dampers with more satisfactory results and greater economy of fuel.

To "keep" fire, the draft dampers must be regulated to suit the draft of chimney; no rule can be laid down in this matter, as no two chimneys draw alike; consequently each apparatus must be regulated as experience teaches and the requirements call for.

If the building is left unoccupied in cold weather, see that all the water is drawn out of the system. To do this it is necessary to open all the air valves, leaving them open until the system is refilled.

In filling the apparatus, open the air valves on the radiators to allow the air in the system to escape. Leave the air valves open until the water runs out, then tightly close them.

Should any of the radiators not circulate, first see that the radiator valve is open, then open the air valve on the radiator affected until the water runs out, then tightly close it. Always refill the expansion tank after drawing off water at the air valves.

CARE OF FIRE, ETC.

The fire should have attention during extremely cold weather at least three times a day. In moderate weather twice a day will be sufficient. This should be early in the morning and late at night.

To obtain good results, the fire should be kept clean and perfectly free from ashes and clinkers. Keep the firepot full of coal and the grate clear of ashes. In the morning after the fire has been cleaned put on only enough coal to cover the fire. When this is burning freely, put on sufficient coal to fill the firepot.

Shake down the ashes and clinkers by a front to rear motion of the upright shaker on the square sectional boilers or a right to left motion of the crank shaker on the round boilers. The square sectional boilers are supplied with two shakers, each operating half of the grate.

Remove the ashes daily from the ashpit to avoid burning out the grates.

The cleanout doors on the front and rear of the boiler should be opened as often as necessary to clean off any deposit on the sections. A cleaning scraper is furnished with the boiler and the surfaces should be cleaned off at least once a month when the boiler is in use, or oftener, depending upon the quality of fuel used. At all other times the cleanout doors should be kept closed.

The water need not be drawn off from the apparatus during the Summer months and it is not necessary to renew the water in an apparatus oftener than once a year. The water should be drawn off and the apparatus refilled with fresh water just before starting the fire in the Fall.

See that the boiler has a separate flue, and at the beginning of each season have the smokepipe cleaned and put in good order.

Use coal of good quality. As a rule stove size coal will give better results than any other.

Unsatisfactory results may usually be traced to one or more of the following causes:

Insufficient quantity of radiating surface.
Improper pitch of pipes.
Obstruction in pipes caused by air or dirt.
Dip in pipes, causing air pockets.
Insufficient size of boiler.
Improper location of boiler.
Improper firing.
Defective construction of chimney.
Imperfect draft of chimney.
Deposits of soot in chimney.
Want of attention.
Improper size and quality of coal.
More than one opening in flue.

PRACTICAL INFORMATION FOR THE FITTER

PERTAINING TO STEAM AND HOT WATER HEATING

LOCATION OF BOILER

Locate the boiler near the chimney whenever possible, and in such relation to it as to allow access to all its sides. Especial attention should be given to securing a good flue of ample capacity, with no other openings into it. The necessity of a good flue should be asserted, and furnishing same become a condition of all guarantees of the boiler, likewise the use of proper fuel.

COAL

The greatest mistake in the selection of coal is usually using too large a size. The great majority of boilers will work better when using "stove" size anthracite coal than under any other conditions, as this size is so proportioned as to give proper amount of air space for good combustion. This is a very important question, in the solving of which many times depends a greater economy in operation. We recommend using either stove or egg size coals, according to the size of the firepot.

CHIMNEY FLUES

The measure of the success and value of a heating system will be finally estimated by its relative efficiency and economy in use. A most important factor in such a system is a chimney flue having ample area, of proper form, height, location, and conditions. These factors are often overlooked by architects, owners, and contractors, the last of whom too often have to suffer the penalty of their indifference or disregard of the absolute requirements through a defaulting or unsatisfactory heating system.

The first consideration of a Heating Engineer in surveying premises for a heating plant should be the chimney and its adequacy to the work that will be required of it. An intelligent and conscientious engineer will ascertain the conditions that confront him at the outset and in the order of most abundant fidelity will advise the owner at the time, rather than to rest and risk his reputation upon the stereotyped insertion in a contract, "the owner must provide a sufficient

flue, having a good draft"—to encounter at a later time the criticisms of a disappointed owner, and possibly an utter defeat in his undertaking.

Chimney Flues should be of ample size and straight from near the cellar floor to above the highest projection of the roof. It should be absolutely independent and of sufficient area for passing sufficient air for the greatest consumption of fuel to be used. Less air will not do; more than is required will do no harm, as it will be within the power of the draft regulator to lessen it. A well-jointed tile flue perfectly round is better than a brick flue of equal area. A square brick flue is preferable to a rectangular one, on account of the greater friction in the latter. Rectangular flues of extreme proportions, i. e., length to width, are very objectionable, as they often induce local currents up and down, which become a distraction.

The value of a flue depends on area and velocity. Velocity alone is no proof of good draft—there must be also sufficient area to carry the gases.

If there is a soot-pocket in the flue below the smokepipe opening, the clean-out door should always be tightly closed. If this soot-pocket has other openings in it—from fireplaces or other connections—these openings check the draft and prevent best heating results from the boiler.

The smokepipe should not extend into the flue beyond the inside surface of the flue, otherwise the end of the pipe cuts down the area of the flue.

The joints, where the smokepipe fits the smokehood of the boiler, or where the pipe enters the chimney, should be made tight with boiler putty or asbestos cement.

Flues of the proper area and height for boilers of various capacities and recommendations for construction will be found on pages 95, 96 and 97.

PROPORTIONING RADIATION FOR STEAM AND WATER HEATING

Owing to the varying conditions surrounding the installation of heating apparatus, it is impossible to make any set rule apply without modification for all kinds of buildings to be heated. It is necessary to take into consideration all of the conditions in and around the building and additions to or deductions made to meet the requirements regardless of what rule may be used in estimating. Generally accepted rules are based on 2-pound steam pressure and a temperature of 180 degrees for water, as indicated at the boiler when the outside temperature is at zero. When systems are designed for heat

ing with a lower temperature at the boiler (vapor, vacuum, etc.), it is necessary to provide additional radiation for different systems.

It is general practice to consider 70 degrees as the standard for inside temperature and zero for the outside. When there is a greater difference between the inside and outside temperature, 1% should be added to the radiation for each degree of difference.

Many contractors make the error of installing a too-small amount of radiation. A little additional surface will give greater economy and insure a first-class system, as well as a pleased owner. An apparatus of ample size can be regulated to give economy, which cannot be done if apparatus is too small and requires forcing.

CLEANING STEAM BOILERS

Accumulations of oil, grease or grit in a new system causes a boiler to foam, prevents generation of steam and produces an unsteady water line. It is, therefore, necessary to blow off boiler under pressure. If one blowing off does not result in a clean water gauge glass, proper generation of steam and a steady water line, the boiler should be blown off a second and, if necessary, a third time. The following method will prove effective:

Connect blow-off pipe to opening in the boiler, extending the pipe outside of the building to some suitable drain. The size of this pipe should be—

Boilers rated 600 sq. ft. to 1200 sq. ft., ¾ in. pipe
Boilers rated 1200 sq. ft. to 2500 sq. ft., 1 in. pipe
Boilers rated 2500 sq. ft. to 4500 sq. ft., 1¼ in. pipe
Boilers rated over 4500 sq. ft., 1½ in. pipe.

Close off all radiator valves on the system or, if the main flow and return lines are equipped with valves, these may be closed instead.

Fill the boiler to the top of gauge glass with water. Build a hot fire in the boiler and blow water and steam out through the blow-off pipe. Maintain as much steam pressure as possible, up to twenty pounds. Supply cold water at the bottom of the boiler and keep water line at top of gauge glass or at a point which will permit the steam to siphon out the surface grease and oil. Continue the blowing off for about two hours. Then close the water feed valve and drain the water through the draw-off down to the proper water line in the boiler.

Remove the blow-off pipe. Open all radiator valves or the valves on the flow and return lines, and the system is ready for operation.

CLEANING A WATER GAUGE GLASS

WITHOUT REMOVING IT

Draw a cupful of hot water from the boiler, into which pour at least a tablespoonful of raw muriatic or other acid.

Close both water gauge valves.

Open top water gauge valve and also pet-cock at bottom and blow water out of glass. Then immediately close the top valve and submerge the end of the pet-cock in the cup of hot water acid solution. A vacuum created in the gauge glass causes the solution in the cup to rush in.

Keep the pet-cock immersed and operate the top valve, slightly opening and closing, alternately expelling and drawing in the solution, until all grease, oil or other matter adhering to the inside of the glass is cut away. Then close pet-cock and open both water gauge valves.

It is necessary to have a steam pressure of one pound or more before commencing this operation, which need not occupy more than ten minutes.

CLEANING BOILER AND CHIMNEY FLUES

A simple and efficient method of cleaning boiler and chimney flues —strongly advocated by the U. S. Fuel Administration—is in the use of salt. The fire should be put in good condition with a substantial body of hot fuel. Well dried common salt is then scattered over the incandescent fuel in quantity depending upon the size of the boiler. For a household boiler, a pound at a time is ample. The dampers should be kept open to maintain the fire until the fumes entirely disappear. This usually takes about half an hour. The soot is disintegrated by the action of the salt fumes. Repeat the application as necessary.

CONSTRUCTION OF CHIMNEYS

It is essential for efficiency and safety that the chimney to which boiler is attached be of proper construction and the flue of ample size.

In the endeavor to establish a construction standard in States, Cities and Towns throughout the country, the National Board of Fire Underwriters' Committee on Construction of Buildings has published complete specifications in the form of a proposed Ordinance for the Construction of Chimneys with appended data as to flue sizes and heights recommended by Furnace and Boiler Manufacturers' Associations.

Some of the paragraphs of special interest to the heating contractor follow:

"The walls of brick chimneys shall be not less than 3¾ inches thick (width of a standard size brick), and shall be lined with fire clay flue lining.

"Chimneys shall be built at least 3 feet above flat roofs, and 2 feet above the ridges of peak roofs, and shall be properly capped with stone, terra cotta, concrete, cast iron or other approved material; but no such cap or coping shall decrease the required flue area.

"Flues shall be built as nearly vertical as possible, but in no case shall they have an angle greater than 45 degrees from the vertical. Where flues change direction, the abutting linings at the angle joints shall be chipped to fit closely, and at no point shall the cross section area be reduced. There shall be but one connection to a flue.

"Not more than two flues shall be permitted in the same flue space, and the joints of any two adjoining sets of flue linings shall be offset at least 7 inches. When there are more than two flues in a chimney, at least each third flue shall be separated from the others by a smoke-tight withe or division wall of brick or concrete at least 3¾ inches thick and bonded into the sidewalls. Each flue intended for a heating furnace or boiler connection, or for a fireplace, shall be separated from other flues by such a withe.

"Irrespective of whether the fuel used be coal, coke, wood or oil, the minimum area inside of chimney flue linings for various heating devices shall be as follows: For low pressure steam or hot water heating boilers, not less than 75 square inches. In no case shall the short cross-section dimension of a rectangular flue be less than two-thirds the greater dimension.

"All flues to which heating furnaces or boilers are to be connected shall be subjected to a smoke test before acceptance, but the test shall not be made until the mortar has thoroughly hardened. The method of test is to build a smudge fire at bottom of the flue and while the smoke is flowing freely from the flue, close it tightly at the top. Escape of smoke into other flues or through the chimney walls indicates openings that shall be made tight before the chimney is accepted.

AREA AND HEIGHTS OF CHIMNEYS

"To secure the most satisfactory draft conditions, the area and height of a chimney should be proportioned to the size and character of heating appliance attached to it. A poor draft is a great annoyance, and is difficult to remedy after a chimney is built.

"A round flue will give a better draft than a square or other rectangular shape having the same cross-sectional area. Round flues are recommended where it is practical to obtain them, but when round flue linings are placed inside rectangular chimney walls, care must be exercised to insure complete filling of the corner spaces,

otherwise there is liable to be air leakage into the vacant spaces, which injures the draft and increases the fire hazard.

"The following table gives the approximate area and height of chimneys recommended by the Furnace and Boiler Manufacturers' Associations."

MINIMUM CHIMNEY FLUE SIZES AND HEIGHTS RECOMMENDED FOR FURNACES AND LOW PRESSURE STEAM AND HOT WATER BOILERS

Area dimensions given are inside measurements of the masonry walls of the chimney

BOILER CAPACITY		NUMBER OF HEATERS ATTACHED TO FLUE							
		1		2		3		4	
Hot Water Rating Sq. Ft.	Steam (Direct) Rating Sq. Ft.	Dim. Inches	Height Feet	Heaters cross-connected forming a battery and attached to one flue opening					
				Dim. Inches	Height Feet	Dim. Inches	Height Feet	Dim. Inches	Height Feet
To 700	To 450	8x12	35						
900	600	8x12	35						
1100	700	8x12	40						
1500	1000	12x12	35						
2500	1500	12x12	40	12x16	45	16x20	50	20x20	55
4000	2500	12x16	40	16x20	50	20x24	55	24x24	60
5800	3600	16x16	45	20x24	55	24x28	60	28x28	65
7300	4500	16x20	50	24x24	60	28x32	65	30x30	70
8700	5400	20x20	55	24x28	65	30x30	70	30x36	80
10000	6400	20x24	60	28x28	70	30x32	80	30x36	90
12000	7400	24x24	65	30x30	75	32x32	85	36x36	90
14000	8400	24x28	65	32x32	75	30x36	85	36x42	100
15000	9400	28x28	70	30x36	80	36x36	90	42x42	100
17000	10400	28x32	70	30x36	80	36x42	90	42x48	100
19000	11400	30x30	70	36x36	80	42x42	90	48x48	100

Where round tile flue lining is used in place of rectangular, the nearest corresponding area shall be taken.

SELECTION OF BOILER

In selecting the size of boiler for use with any heating system, due consideration should be given all conditions surrounding the particular installation for which boiler is required.

Boiler ratings as g ven are derived from careful and exhaustive tests which proved their safety, and are based on a standard of 2 lbs. pressure maintained at the boiler for steam and 180 degrees for hot water.

All Piping (mains and risers, flows and returns) is to be figured as radiating surface in addition to the direct and indirect radiation attached to same. Under average conditions the allowance for piping may be considered equal to approximately 50% of the net amount of cast iron radiation.

It is important, in determining correct boiler capacities for given loads, that ample safety factors of reserve capacity be provided.

Sufficient radiation must be installed to easily raise and maintain a temperature of 70 degrees.

Additional allowance must be made for use of direct-indirect, indirect radiation and contingencies, as follows:

Direct-indirect radiators: Each foot of surface is considered equal to 1⅓ ft. of direct radiation.

Indirect radiators: Each foot of surface is considered equal to 1½ ft. of direct radiation.

Pipe Coils: Each foot of surface is considered equal to 1¼ ft. of direct radiation.

Coil, waterback, or other appliance for heating water for domestic use: Each gallon of storage capacity is considered equal to 2 ft. of direct steam radiators, or 3 ft. of direct water radiators.

FORMULAS FOR FIGURING DIRECT RADIATION BASED ON WALL AND GLASS EXPOSURES

JOHN H. MILLS: One square foot of radiating surface for each two square feet of glass, and for each twenty square feet of outside wall, and every two hundred cubic feet of space.

EXAMPLE:

Glass exposure, square feet,	60, 1 to 2 =	30
Wall outside, square feet,	210, 1 to 20 =	10½
Cubical contents, cubic feet,	2016, 1 to 200 =	10
	Total	50½ sq. ft. steam

For water, by generally accepted standards, add 60 per cent., equals 80 sq. ft. water.

PROF. R. C. CARPENTER, Cornell University: To the square feet of glass surface, add one quarter of the exposed wall surface, and 1-55 to 3-55 of cubical contents. (1-55 for rooms on upper floors, 2-55 for rooms on first floor, and 3-55 for large halls); then for steam multiply by .25; for water by .40.

EXAMPLE—Room as above.

Glass exposure, 60 square feet, to which add one-quarter of wall 210 ÷ 4 = 52, to which add (room first floor) 2-55 cubical contents − 2-55 × 2016 = 73. Thus 60 + 52 + 73 = 185 × .25 (for steam) = 46 square feet; or, 185 × .40 (for water) = 74 square feet.

NUMBER OF GALLONS IN ROUND TANKS

Length or Depth in Feet	Diameter in Inches									
	18	24	30	36	42	48	54	60	66	72
2	26	47	73	105	144	188	238	294	356	424
2½	33	59	90	131	180	235	298	367	445	530
3	40	71	109	157	216	282	357	440	534	636
3½	47	83	127	183	252	329	416	513	623	742
4	54	95	145	209	288	376	475	586	712	848
4½	61	107	163	235	324	423	534	659	801	954
5	68	119	180	261	360	470	593	732	890	1060
5½	75	131	200	287	396	517	652	805	979	1166
6	82	143	217	313	432	564	711	878	1068	1272
6½	89	155	235	339	468	611	770	951	1157	1378
7	96	167	253	365	504	658	829	1024	1246	1484
7½	103	179	271	391	540	705	888	1097	1335	1590
8	110	191	289	417	576	752	947	1170	1424	1696
8½	....	203	307	443	612	799	1006	1243	1513	1802
10	....	239	361	521	720	940	1183	1462	1780	2120
12	....	287	433	625	864	1128	1419	1754	2136	2544
14	....	....	....	....	1008	1316	1655	2046	2492	2968
16	....	....	....	....	1152	1504	1891	2338	2848	3392
18	....	....	....	....	....	....	2127	2630	3204	3816
20	....	....	....	....	....	....	2363	2922	3560	4240

Note.—Above information is quoted from standard authorities. Not guaranteed.

CAPACITY OF RECTANGULAR TANKS

To find how many U. S. gallons any rectangular tank will hold: Multiply the inside length, depth and width which gives the contents of the tank in cubic inches, or in cubic feet as case may be. If in inches, divide by 1728 and you have the contents in cubic feet. Then multiply that result by 7.4805 (U. S. gallons in each cubic foot of water) and the final result is the number of U. S. gallons the tank will contain.

CAPACITY OF CYLINDRICAL TANKS

To find how many U. S. gallons a cylindrical tank will hold: Multiply the square of the inside diameter by 0.7854, which gives the area; multiply that result by the depth and this gives the cubic contents of the tank. If measurements are in inches, divide the cubic contents by 1728 and you then have contents expressed in cubic feet; then multiply by 7.4805 (U.S. gallons in each cubic foot of water) and the final result is the number of U. S. gallons the tank will contain.

HEATING SURFACE IN WROUGHT PIPE

Length of Pipe in Feet	Size of Pipe									
	¾	1	1¼	1½	2	2½	3	4	5	6
1	.275	.346	.434	.494	.622	.753	.916	1.175	1.455	1.730
2	.5	.7	.9	1.0	1.2	1.5	1.8	2.4	2.9	3.5
3	.8	1.0	1.3	1.5	1.9	2.3	2.7	3.5	4.4	5.2
4	1.1	1.4	1.7	2.0	2.5	3.0	3.6	4.7	5.8	7.0
5	1.4	1.7	2.2	2.4	3.1	3.8	4.6	5.8	7.3	7.7
6	1.6	2.1	2.6	2.9	3.7	4.5	5.5	7.0	8.7	10.5
7	1.9	2.4	3.0	3.4	4.4	5.3	6.4	8.2	10.2	12.1
8	2.2	2.8	3.5	3.9	5.0	6.0	7.3	9.4	11.6	13.9
9	2.5	3.1	3.9	4.4	5.6	6.8	8.2	10.6	13.1	15.7
10	2.7	3.5	4.3	4.9	6.2	7.5	9.1	11.8	14.6	17.4
11	3.0	3.8	4.8	5.4	6.8	8.3	10.0	12.9	16.0	19.1
12	3.3	4.1	5.2	5.9	7.5	9.0	11.0	14.1	17.4	20.9
13	3.6	4.5	5.6	6.4	8.1	9.8	11.9	15.3	18.9	22.6
14	3.8	4.8	6.1	6.9	8.7	10.5	12.8	16.5	20.3	24.3
15	4.1	5.2	6.5	7.4	9.3	11.3	13.7	17.6	21.8	26.1
16	4.4	5.5	6.9	7.9	10.0	12.0	14.6	18.8	23.2	27.8
17	4.7	5.9	7.4	8.4	10.6	12.8	15.5	20.0	24.7	29.5
18	5.0	6.2	7.8	8.9	11.2	13.5	16.5	21.2	26.2	31.3
19	5.2	6.6	8.3	9.4	11.8	14.3	17.4	22.3	27.6	33.1
20	5.5	6.9	8.7	9.9	12.5	15.0	18.3	23.5	29.1	34.8
25	6.9	8.6	10.9	12.3	15.6	18.8	22.9	29.3	36.3	43.5
30	8.3	10.4	13.0	14.8	18.7	22.5	27.5	35.3	43.6	52.1
35	9.6	12.1	15.2	17.3	21.8	26.3	32.0	41.1	50.9	60.8
40	11.0	13.8	17.4	19.8	24.9	30.1	36.6	47.0	58.2	69.5
45	12.4	15.6	19.5	22.2	28.0	33.8	41.2	52.9	65.5	78.2
50	13.8	17.3	21.7	24.7	31.1	37.6	45.8	58.7	72.7	87.0
55	15.2	19.0	23.9	27.1	34.3	41.3	50.4	64.6	80.1	95.6
60	16.6	20.8	26.0	29.6	37.3	45.2	55.0	70.5	87.3	104.3
65	18.0	22.6	28.2	32.1	40.5	48.8	59.5	76.4	94.5	112.9
70	19.4	24.2	30.4	34.6	43.5	52.7	64.1	82.3	101.9	121.7
75	20.7	26.0	32.6	37.1	46.6	56.5	68.7	88.1	109.1	130.4
80	22.0	27.7	34.7	39.6	49.8	60.2	73.3	94.0	116.4	139.1
85	23.4	29.4	36.9	42.0	53.4	63.9	77.8	99.9	123.7	147.9
90	24.8	31.1	39.1	44.5	56.0	67.8	82.4	105.8	130.9	156.5
95	26.2	32.9	41.2	46.9	59.6	71.5	87.2	111.6	138.2	165.2
100	27.5	34.6	43.4	49.4	62.2	75.3	91.6	117.5	145.5	173.0

The above table will be found very convenient in estimating the amount of radiating surface in mains, etc.

AREAS OF CIRCLES

Size	Area	Size	Area	Size	Area	Size	Area
⅛	0.0123	10	78.54	30	706.86	65	3318.3
¼	0.0491	½	86.59	31	754.76	66	3421.2
⅜	0.1104	11	95.03	32	804.24	67	3525.6
½	0.1963	½	103.86	33	855.30	68	3631.6
⅝	0.3067	12	113.09	34	907.92	69	3739.2
¾	0.4417	½	122.71	35	962.11	70	3848.4
⅞	0.6013	13	132.73	36	1017.8	71	3959.2
1	0.7854	½	143.13	37	1075.2	72	4071.5
⅛	0.9940	14	153.93	38	1134.1	73	4185.3
¼	1.227	½	165.13	39	1194.5	74	4300.8
⅜	1.484	15	176.71	40	1256.6	75	4417.8
½	1.767	½	188.69	41	1320.2	76	4536.4
⅝	2.073	16	201.06	42	1385.4	77	4656.0
¾	2.405	½	213.82	43	1452.2	78	4778.3
⅞	2.761	17	226.98	44	1520.5	79	4901.6
2	3.141	½	240.52	45	1590.4	80	5026.5
¼	3.976	18	254.46	46	1661.9	81	5153.0
½	4.908	½	268.80	47	1734.9	82	5281.0
¾	5.939	19	283.52	48	1809.5	83	5410.6
3	7.068	½	298.64	49	1885.7	84	5541.7
¼	8.295	20	314.16	50	1963.5	85	5674.5
½	9.621	½	330.06	51	2042.8	86	5808.8
¾	11.044	21	346.36	52	2123.7	87	5944.6
4	12.566	½	363.05	53	2206.1	88	6082.1
½	15.904	22	380.13	54	2290.2	89	6221.1
5	19.635	½	397.60	55	2375.8	90	6361.7
½	23.758	23	415.47	56	2463.0	91	6503.8
6	28.274	½	433.73	57	2551.7	92	6647.6
½	33.183	24	452.39	58	2642.0	93	6792.9
7	38.484	½	471.43	59	2733.9	94	6939.7
½	44.178	25	490.87	60	2827.4	95	7088.2
8	50.265	26	530.93	61	2922.4	96	7238.2
½	56.745	27	572.55	62	3019.0	97	7389.8
9	63.617	28	615.75	63	3117.2	98	7542.9
½	70.882	29	660.52	64	3216.9	99	7697.7

To find the diameter of a circle when the circumference is given, multiply the given circumference by .3183.

TELEGRAPH CODE

MONARCH WATER TUBE BOILERS

Size	Steam	Water	Size	Steam	Water
No. 4-22.....	Ben	Alma	No. 12-40.....	Teddy	Pearl
No. 5-22.....	Dave	Madge	No. 13-40.....	Abe	Becky
No. 6-22.....	Pat	Ellen	No. 14-40.....	Dan	Molly
No. 7-22.....	Isaac	Rachael	No. 15-40.....	Dick	Ruth
No. 8-22.....	Rufus	Nancy	No. 16-40.....	Alan	Betsey
No. 4-28.....	Mike	Nora	No. 6-60.....	Basil	Judith
No. 5-28.....	Percy	Loretta	No. 7-60.....	Donald	Melissa
No. 6-28.....	Joe	Agnes	No. 8-60.....	Alex	Esther
No. 7-28.....	Bert	Lillian	No. 9-60.....	Gregory	Phyllis
No. 8-28.....	Arthur	Ethel	No. 10-60.....	Jasper	Octavia
No. 9-28.....	Phil	Eunice	No. 11-60.....	Eric	Sabina
No. 10-28.....	Claude	Dinah	No. 12-60.....	Bruno	Georgina
No. 11-28.....	Elmer	Myra	No. 13-60.....	Amos	Deborah
No. 12-28.....	Ivan	Emily	No. 14-60.....	Eben	Matilda
No. 5-40.....	Leroy	Augusta	No. 15-60.....	Jonas	Roxana
No. 6-40.....	Harry	Daisy	No. 16-60.....	Noah	Vida
No. 7-40.....	Billy	Eva	No. 17-60.....	Godfrey	Tracy
No. 8-40.....	Jim	Hattie	No. 18-60.....	Silas	Miriam
No. 9-40.....	Tom	Rose	No. 19-60.....	Rudy	Libby
No. 10-40.....	Sam	Maggie	No. 20-60.....	Roland	Antonia
No. 11-40.....	Bob	Kitty			

HEADER TYPE

No. H- 4-22..	Archie	Josephine	No. H-12-28..	Owen	Tave
No. H- 5-22..	Max	Stella	No. H- 5-40..	Albert	Belle
No. H- 6-22..	Jerry	Flossie	No. H- 6-40..	Henry	Ann
No. H- 7-22..	Alfred	Julia	No. H- 7-40..	Herbert	Ruby
No. H- 8-22..	Seth	Patty	No. H- 8-40..	Fred	Alice
No. H- 4-28..	Oscar	Eleanor	No. H- 9-40..	Eugene	Gertrude
No. H- 5-28..	Edwin	Estelle	No. H-10-40..	George	Henrietta
No. H- 6-28..	Andrew	Kathleen	No. H-11-40..	Ernest	Sarah
No. H- 7-28..	Benjamin	Viola	No. H-12-40..	Howard	Jane
No. H- 8-28..	Jacob	Edna	No. H-13-40..	Alvah	Agatha
No. H- 9-28..	Raymond	Cecilia	No. H-14-40..	Darius	Beatrice
No. H-10-28..	Enos	Lenore	No. H-15-40..	Brian	Hester
No. H-11-28..	Neil	Peggy	No. H-16-40..	Phineas	Kesiah

MONARCH SMOKELESS BOILERS

No. 22- 5.....	Aaron	Elvira	No. 40-14.....	Martin	Rhoda
No. 22- 6.....	Cecil	Catharine	No. 40-15.....	Hubert	Ursula
No. 22- 7.....	Eli	Louise	No. 40-16.....	Burton	Mildred
No. 22- 8.....	Noel	Phebe	No. 40-17.....	Austin	Ella
No. 28- 5.....	Kenneth	Teresa	No. 40-18.....	Conrad	Inez
No. 28- 6.....	Abram	Linda	No. 40-19.....	Gerard	Juliet
No. 28- 7.....	Baldwin	Vivian	No. 40-20.....	Mark	Delia
No. 28- 8.....	Zachary	Winifred	No. 60- 7.....	Edmund	Hannah
No. 28- 9.....	Urban	Cynthia	No. 60- 8.....	Justin	Serena
No. 28-10.....	Toby	Joan	No. 60- 9.....	August	Priscilla
No. 28-11.....	Quentin	Grizel	No. 60-10.....	Larry	Salome
No. 28-12.....	Samson	Lois	No. 60-11.....	Nathan	Gratia
No. 40- 5.....	Paul	Justina	No. 60-12.....	Caleb	Annette
No. 40- 6.....	Roger	Shirley	No. 60-13.....	Evan	Ulrica
No. 40- 7.....	Saul	Marcia	No. 60-14.....	Jeff	Victoria
No. 40- 8.....	Titus	Ellison	No. 60-15.....	Calvin	Trudy
No. 40- 9.....	Pliny	Charlotte	No. 60-16.....	Vincent	Eugenie
No. 40-10.....	Garrett	Dorcas	No. 60-17.....	Enoch	Terry
No. 40-11.....	Jesse	Harriet	No. 60-18.....	Richard	Minetta
No. 40-12.....	Leonard	Lydia	No. 60-19.....	Ethan	Aurora
No. 40-13.....	Nicholas	Maria	No. 60-20.....	Jerome	Olympia

TELEGRAPH CODE

VOLUNTEER NEW SERIES BOILERS

Size	Steam	Water	Size	Steam	Water
No. 174.....	Abel	Cora	No. 227.....	Eldred	Letitia
No. 175.....	Job	Miranda	No. 254.....	Albion	Althea
No. 176.....	Ellis	Sophia	No. 255.....	Herman	Rosalind
No. 194.....	Jared	Melicent	No. 256.....	Egbert	Ophelia
No. 195.....	Emory	Huldah	No. 257.....	Goddard	Penelope
No. 196.....	Hilary	Evelyn	No. 284.....	Ferdinand	Corinna
No. 224.....	Alonzo	Persis	No. 285.....	Caesar	Constance
No. 225.....	Elihu	Irene	No. 286.....	Clement	Frederica
No. 226.....	Gideon	Joyce	No. 287.....	Cuthbert	Philippa

VOLUNTEER (Center Nipple Type)

No. 15B.....	Ike	Florence	No. 23C.....	Victor	Isabel
No. 17B.....	David	Jennie	No. 23D.....	Clifford	Flora
No. 17C.....	James	Anna	No. 23E.....	Reginald	Amelia
No. 17D.....	Hiram	Virginia	No. 25B.....	Alaric	Eliza
No. 19B.....	Isidor	Vera	No. 25C.....	Dennis	Jemima
No. 19C.....	Walter	Mattie	No. 25D.....	Hugo	Sibyl
No. 19D.....	Samuel	Elsie	No. 25E.....	Jason	Rosalie
No. 21B.....	Giles	Amy	No. 28B.....	Abner	Camille
No. 21C.....	Ira	Mabel	No. 28C.....	Adam	Barbara
No. 21D.....	Luke	Polly	No. 28D.....	Duncan	Geraldine
No. 21E.....	Miles	Olive	No. 28E.....	Geoffrey	Diana
No. 23B.....	Ralph	Edith			

VOLUNTEER (Screw Nipple Type—with Jacket)

No. 0.....	Francis	May	No. 7½.....	Abraham	Blanche
No. 1.....	Peter	Helen	No. 8.....	Lewis	Mary
No. 1½.....	Oliver	Marion	No. 9.....	Thomas	Josie
No. 2.....	Edward	Clara	No. 9½.....	Simon	Bertha
No. 3.....	John	Sadie	No. 10.....	Robert	Kate
No. 3½.....	Daniel	Maude	No. 11.....	Stephen	Ida
No. 4.....	Charles	Fanny	No. 11½.....	Harold	Minnie
No. 5.....	Frederick	Marjorie	No. 12.....	Frank	Laura
No. 5½.....	Lester	Lottie	No. 13½.....	Theodore	Emma
No. 6.....	William	Grace	No. 14.....	Joseph	Carrie
No. 7.....	Norman	Martha	No. 16.....	Willard	Lulu

VOLUNTEER HOT WATER SUPPLY BOILERS

No. 211.....	Ada	No. 315.....	Lucy
No. 311.....	Bridget	No. 317.....	Susan
No. 215.....	Caroline	No. 319.....	Paula

RED DIAMOND JACKETED BOILERS

1-S-4.....	Ajax	1-W-4.....	Clio
1-S-5.....	Cadmus	1-W-5.....	Echo
2-S-4.....	Eros	2-W-4.....	Fortuna
2-S-5.....	Icarus	2-W-5.....	Hebe
3-S-4.....	Comus	3-W-4.....	Lamia
3-S-5.....	Janus	3-W-5.....	Minerva
4-S-4.....	Adonis	4-W-4.....	Luna
4-S-5.....	Castor	4-W-5.....	Hero
5-S-4.....	Midas	5-W-4.....	Leto
5-S-5.....	Milo	5-W-5.....	Rhea

PRINTED IN U.S.A. Rogers & Company, New York